ESCORT 300A
Defibrillator/Noninvasive Pacer

SERVICE MANUAL

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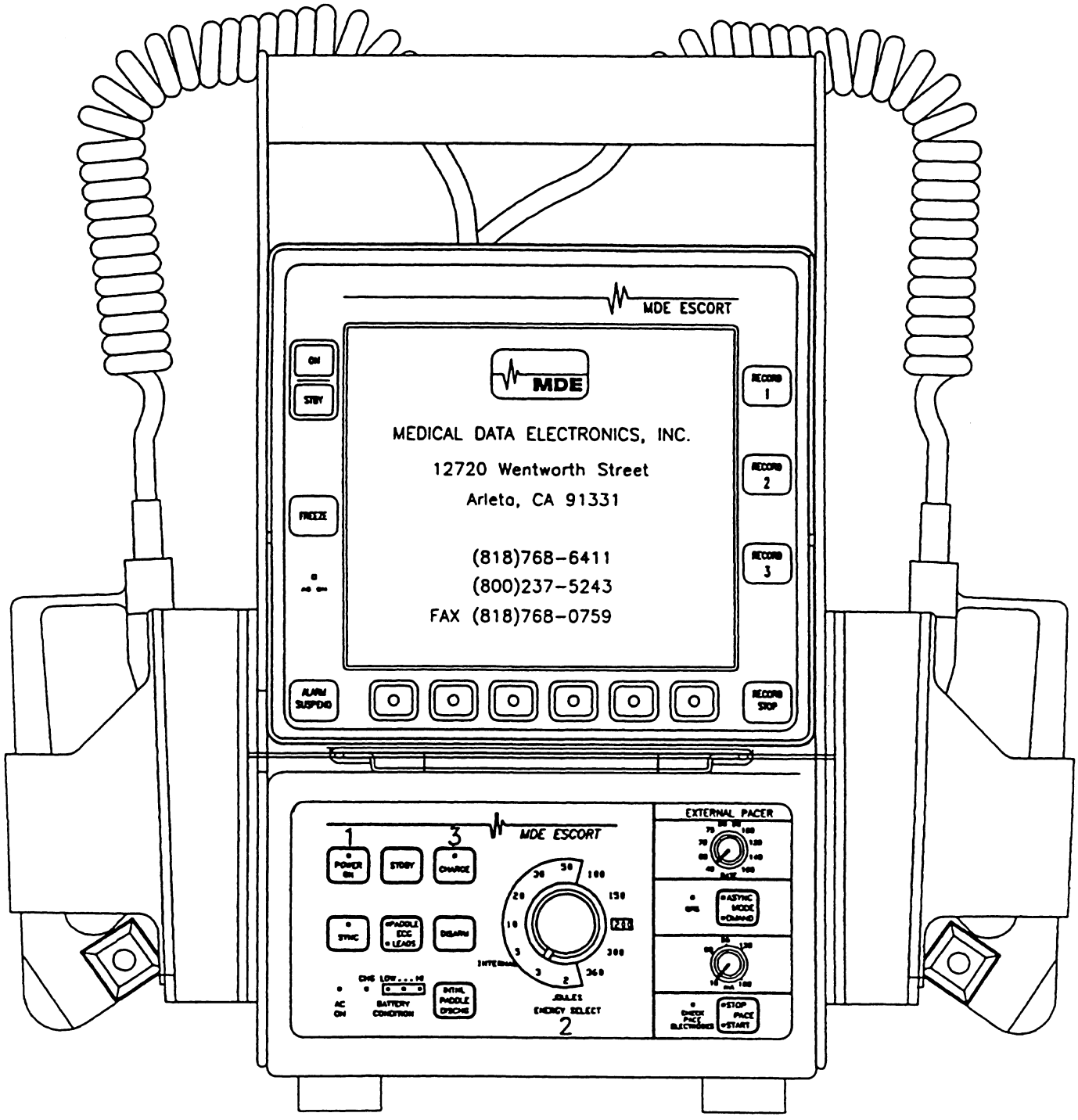
DEFIBRILLATOR/PACER
SERVICE MANUAL



MAY 1995
REVISION D

WARRANTY

This Defibrillator is warranted against defects in materials and workmanship for the period of 12 months from the date of shipment to original purchaser. Batteries, cables, cuffs, sensors and electrodes are warranted three months from date of shipment. Warranty is valid only to the original buyer. Defective equipment should be returned freight prepaid. Equipment returned with defective parts and assemblies will be either replaced or repaired. This warranty is not applicable if repair has been attempted or if the instrument has been damaged due to operation outside the environmental and power specifications for the product, or due to improper handling or use.

If any default develops, notify Medical Data Electronics, giving full details of the difficulty, including the model and serial number of the device. On receipt of the shipping instructions, forward the device, prepaid, and repairs will be made at the factory. If requested, an estimate will be made before work begins, provided the device is not covered by warranty.

The foregoing warranty is in lieu of all other warranties expressed or implied, including but not limited to any implied warranty or merchantability, fitness or adequacy for any particular purpose or use. Medical Data Electronics shall not be liable for any special, incidental or consequential damages.

Factory Service is available by obtaining an RMA number from the MDE Technical Support Department. Please have model number and serial number ready when calling.

NOTE:

When returning defibrillator/pacer to M.D.E. Technical Support Department for repair, ship with the **battery removed** and the paddle assembly disconnected.

WARNING!

To avoid personal injury, the user should not perform any servicing unless qualified to do so.

CAUTION:

Only qualified (Authorized) personnel should attempt to perform repairs or removal of any parts within this system. Opening the unit or removing the covers could violate the warranty.

WARNING:

High Voltage/High Energy Potentials. This instrument stores high voltage potentials at high energy levels which are potentially lethal. Before servicing this instrument or removing any covers, insure the storage capacitor has been completely discharged, remove AC power mains, remove the battery, and remove the paddle assembly.

NOTE:

This system contains static sensitive circuitry. Use ESD precautions when handling electronic components and printed circuit board assemblies.

WARNING:

Improper servicing or maintenance may result in improper calibration and instrument failure.

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WARNING:

IMPROPER CALIBRATION OF THIS INSTRUMENT

MAY RESULT IN HAZARDOUS

OPERATION OR FAILURE OF THIS DEVICE

1.0.0 DEFIBRILLATOR SPECIFICATIONS

Defibrillator: Damped Sinusoid per AAMI specifications.

Energy Select: 2, 3, 5, 10, 20, 30, 50, 100, 150, 200, 300, 360 joules

Charge Time: To 360 joules in 12 seconds with fully charged battery.

Energy Bleed: 10% Maximum after 60 seconds.

Auto Internal Discharge: 60 seconds after charge, or power off.

Armed Indication: Charge completed tone, charge indicator on front panel and sternum paddle.

Charge Controls: Control on apex paddle and on front panel.

Synchronizer: Synchronizes defibrillator pulse to patient generated R wave; monitor ECG size control acts as threshold control; energy discharges within 60 msec. of synchronizer marker on monitor display.

Paddles: Standard paddles are adult anterior/anterior; optional internal paddles; optional pediatric paddles slide over adult paddles.

External Paddle Size: Adult - 60 cm^2
Pediatric - 13 cm^2

Paddle Cord Length: 10 feet (3.0 m)

Internal Paddle Sizes: Adult (large) 8.9 cm diameter
Child (medium) 6.4 cm diameter
Pediatric/Neonatal (small) 3.8 cm diameter

Internal Paddles Cable: 21 feet (6.4 m)

Internal Paddles Energy Interlock: Maximum of 50 joules with internal paddles connected.

1.1.0 SPECIFICATIONS - NON-INVASIVE PACER

Type:	Selectable, demand or asynchronous
Rate:	40, 60, 70, 75, 80, 90, 100, 120, 140, 160 ppm ± 3% or 3 ppm
Duration:	20 msec. - 0 msec, + 4 msec
Waveform:	Monophasic truncated exponential with 20% droop
Current:	10 to 180 mA, continuously adjustable
Refractory Period:	300 msec.
Leads off detect:	Pace electrode lead fail indicator

1.2.0 SPECIFICATIONS - POWER

AC Main: Selectable 110/220 VAC, 60/50 Hz

Battery Type: 2.3 AH sealed lead acid interchangeable pack, powers defib/pacer base only; separate battery system powers detachable monitor.

Battery Capacity: 35 charges at 360 joules, or five hours of pacing at 100 ma 70 ppm.

Battery Charge Time: six hours to 90%, optional external charger, three hours.

Battery Level Indication: Low, mid, and high level visual indicators on front panel, separate available low battery indicators for monitor and defibrillator.

Power Consumption:

Nominal -	2 watts
Charging Battery -	12 watts
Charging paddles -	135 watts

1.2.1 SPECIFICATIONS - PHYSICAL

Size: 11" H, 7" W, 16" D
27.94 cm H, 17.78 cm W, 40.64 cm D.

Weight: Option 19 E: 21.5 lbs (9.8Kg)
Option 20 E: 22 lbs (10Kg)

Environmental: Operating temp: 5° to 40° C
Humidity: 0 - 90% non-condensing

SYSTEM OVERVIEW

CHAPTER 2

2.0.0 SYSTEM OVERVIEW

2.1.0 OVERVIEW

The **ESCORT DEFIBRILLATOR** and **DEFIBRILLATOR/PACER OPTION** mounts to the **E300A** series monitor to provide defibrillator or defibrillator and noninvasive pacing.

The defibrillator has a minimum of five PCBA's and a maximum of six PCBA's. These include a mother board, relay board, power board, isolation board, logic board, and optional pacer board.

2.2.0 MOTHER BOARD

The mother board is primarily a passive device used to facilitate interconnections between PCBA assemblies, key pad, indicators, and power input. The flyback transformer, which is the critical component powered by the power PCBA to charge the storage capacitor, is located on the mother board.

2.3.0 POWER BOARD

The defibrillator power board provides rectification for defibrillator operation and regulation for battery charging. Power for the defibrillator charging circuit is generated on this board as well as sensing for defibrillator energy select. The relay drive signals for the energy transfer relay and the internal dump relay are also generated on this board. Two safety circuits are contained within the power board which lock out defibrillator charging above 50 joules when internal paddles are used and a 4.75 kV lockout to prevent overcharging of the storage capacitor.

2.4.0 DEFIBRILLATOR ISO BOARD

The defibrillator isolation board provides system power on and STDBY as well as voltage regulation for the defibrillator. This board generates isolated power to run the isolation circuitry where the paddles ECG information is processed. The isolation board carries out battery level detection and battery level display functions for the defibrillator.

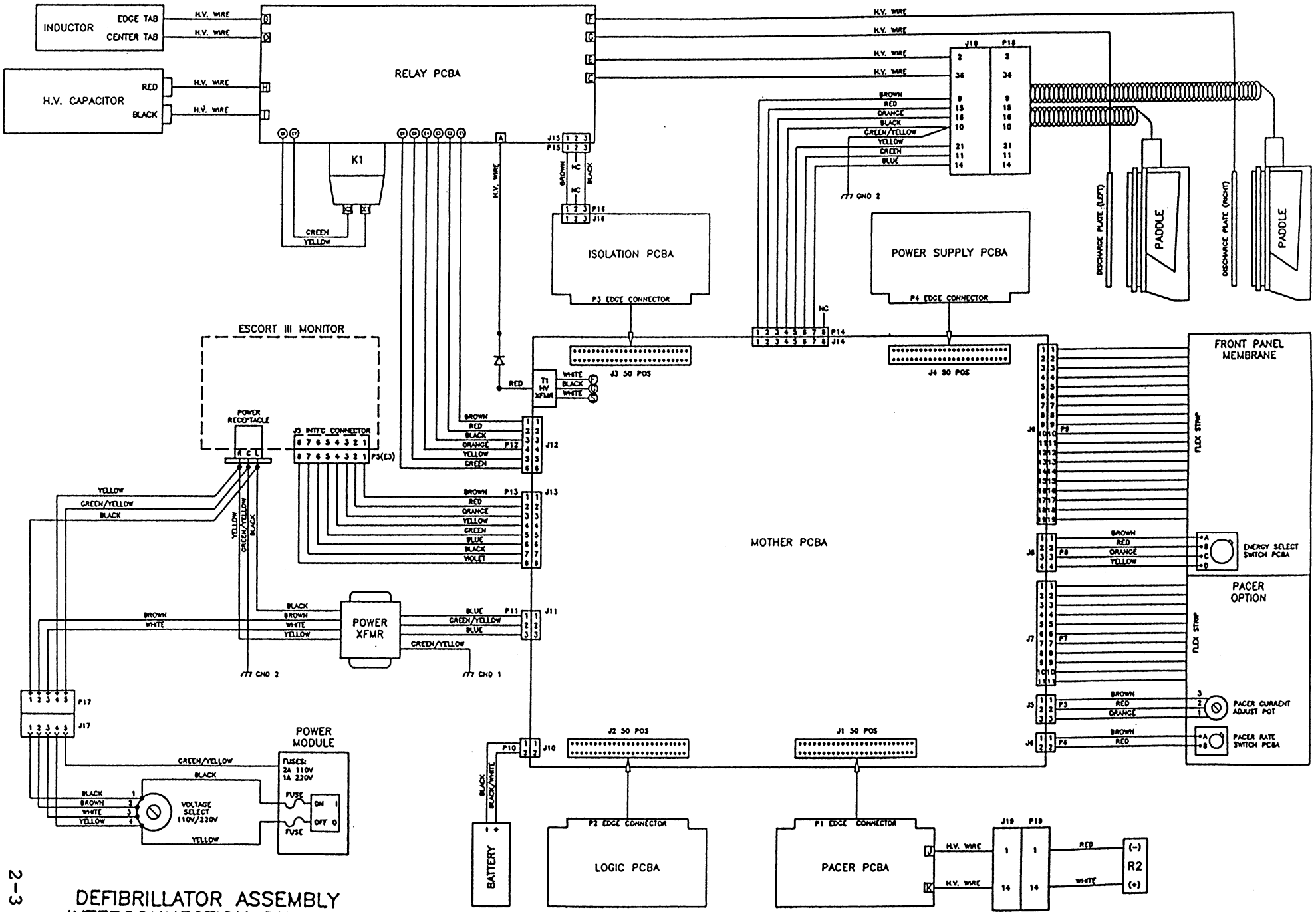
2.5.0 LOGIC BOARD

The defibrillator logic board provides all human interface functions which include keypad input processing with all

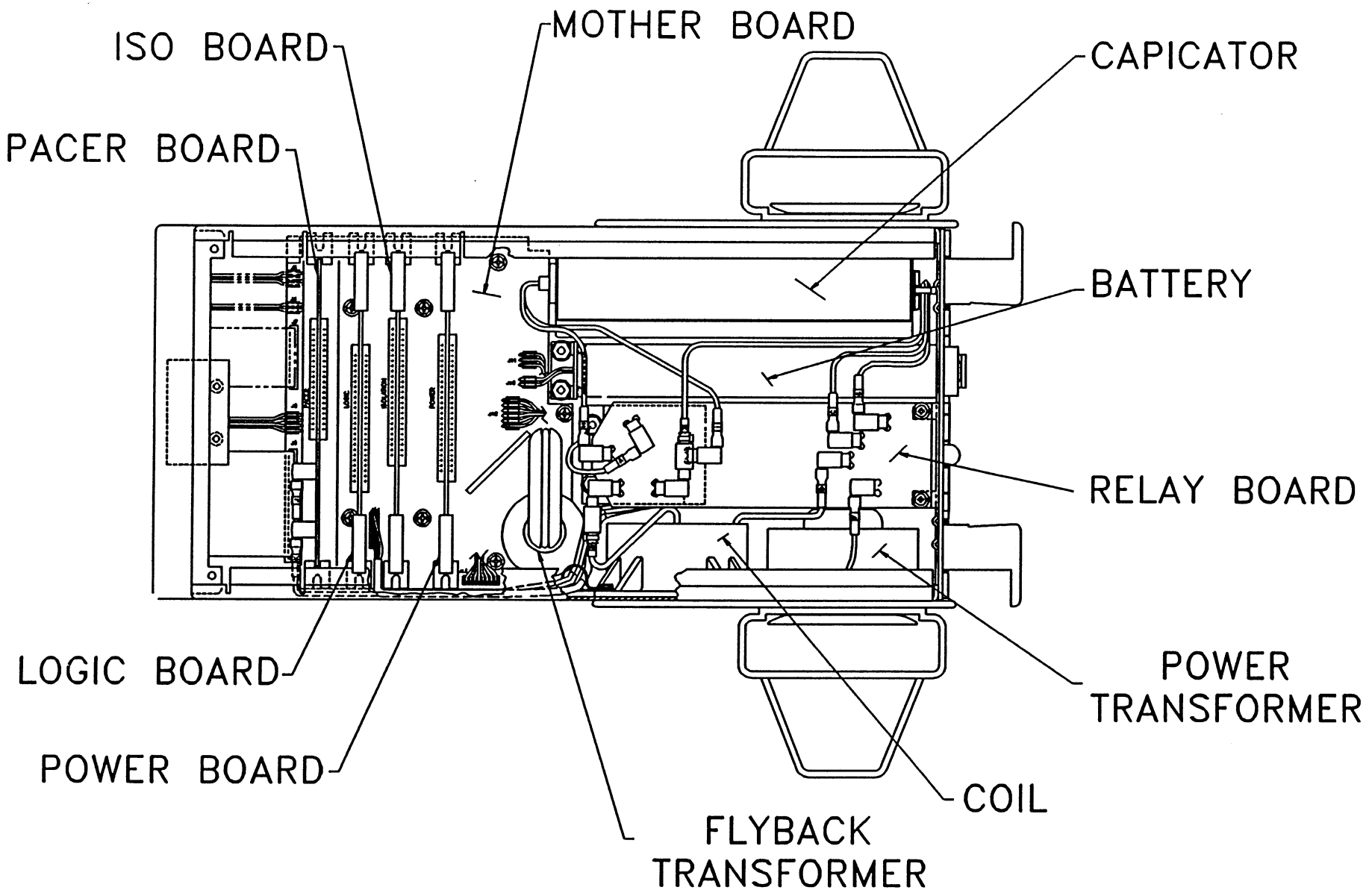
display functions and the generation of tones for alarms and condition flags. R wave detection and the generation of an R wave flag for sync mode operations of the defibrillator are contained within this board. The logic board provides the logic and control circuitry to select ECG input from paddles or leads. The master clock is maintained within this board which provides all timing functions, auto internal discharge and sync up with the **E300A** timing.

2.6.0 RELAY BOARD

The defibrillator relay board provides the current path for charging the storage capacitor as well as the transfer of energy from the storage capacitor to the paddles for delivery. The internal dump relay and the test load for operator testing of the defibrillator are also located on this board.



DEFIBRILLATOR ASSEMBLY
INTERCONNECTION DIAGRAM



Bottom View

BOTTOM COVER REMOVED FOR CLARITY

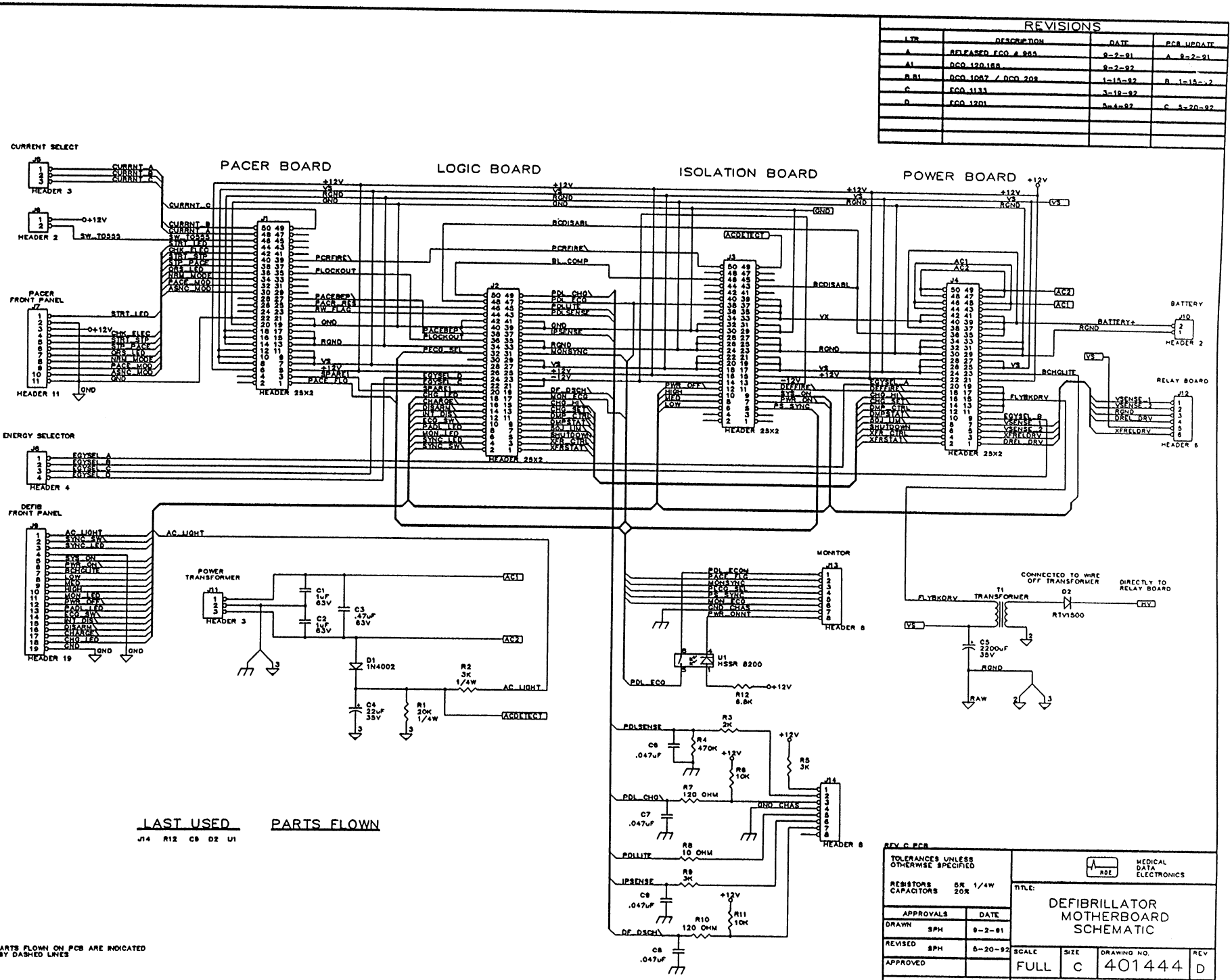
MOTHER BOARD

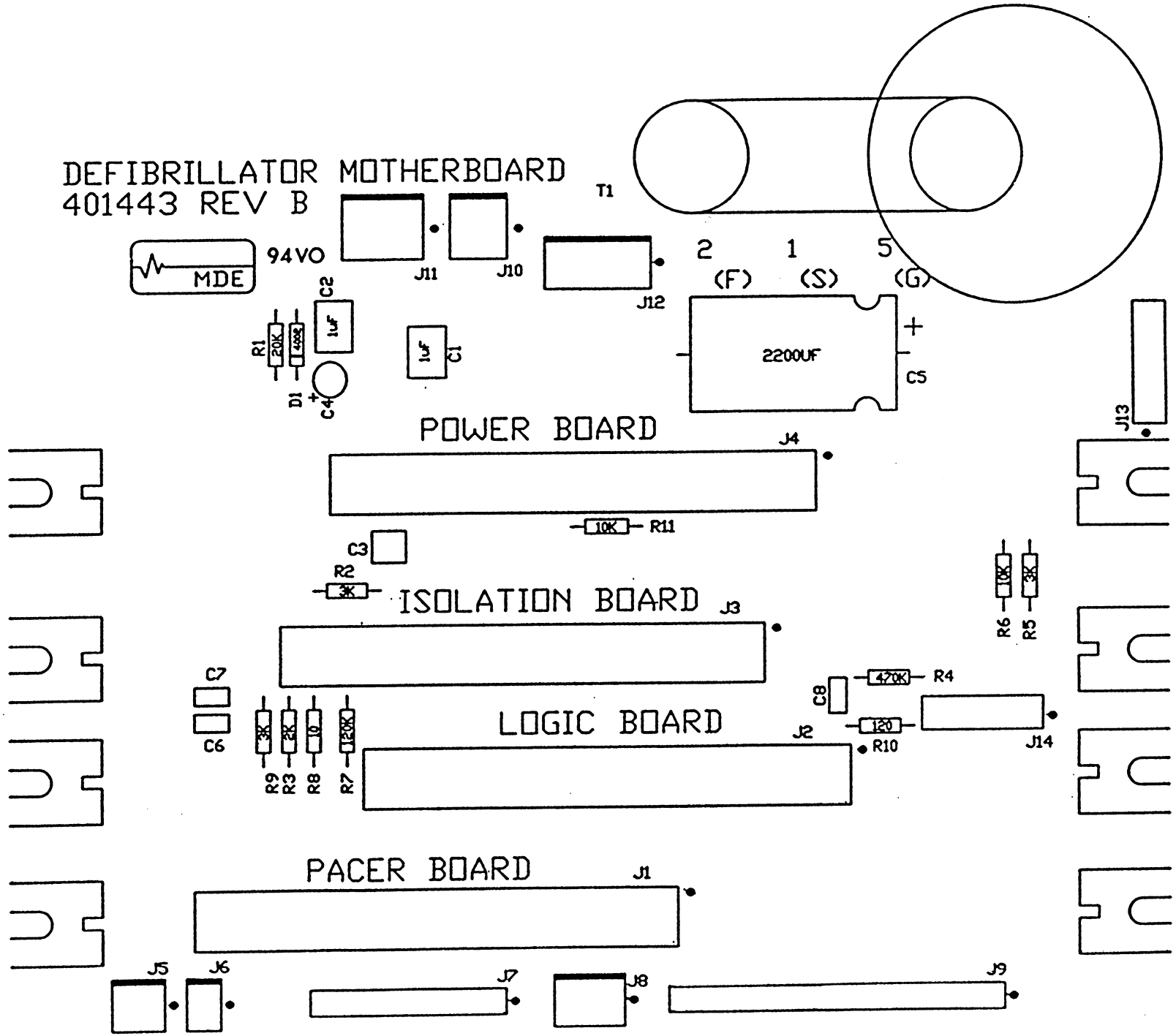
CHAPTER 3

3.0.0 MOTHER BOARD

Located on the mother board is the flyback transformer. The flyback transformer is the critical component driven by the power board to charge the storage capacitor.

The mother board provides interconnections for all functions of the defibrillator.


REVISIONS
LTR | DESCRIPTION | DATE | PCB UPDATE
A | RELEASED ECO # 969 | 9-2-91 | A 9-2-91
A1 | DCO 120188 | 9-2-92 |
B B1 | DCO 1087 / DCO 209 | 1-14-92 | B 1-14-92
C | ECO 1133 | 3-18-92 |
D | ECO 1201 | 9-4-92 | C 9-20-92
CURRENT SELECT
PACER BOARD
LOGIC BOARD
ISOLATION BOARD
POWER BOARD
PACER FRONT PANEL
ENERGY SELECTOR
DEFIB FRONT PANEL
POWER TRANSFORMER
MONITOR
BATTERY
RELAY BOARD
CONNECTED TO WIRE OFF TRANSFORMER
DIRECTLY TO RELAY BOARD
LAST USED
J14 R12 C8 D2 U1
PARTS FLOWN
NOTE: PARTS FLOWN ON PCB ARE INDICATED BY DASHED LINES
REV C PCB
TOLERANCES UNLESS OTHERWISE SPECIFIED
RESISTORS 5% 1/4W
CAPACITORS 20%
APPROVALS | DATE
DRAWN SPH | 9-2-91
REVISED SPH | 5-20-92
APPROVED
DEFMOMC.SCH
MEDICAL DATA ELECTRONICS
TITLE: DEFIBRILLATOR MOTHERBOARD SCHEMATIC
SCALE FULL | SIZE C | DRAWING NO. 401444 | REV D
DO NOT SCALE DRAWING | SHEET 1 OF 1
3-2


DEFIBRILLATOR MOTHERBOARD
401443 REV B
T1
MDE
94VO
J11
J10
J12
2
1
5
(F)
(S)
(G)
C2
1uF
R1
20K
430Ω
D1
C4
1uF
C1
2200UF
C5
J13
POWER BOARD
J4
10K
R11
C3
R2
3K
ISOLATION BOARD
J3
R6
10K
R5
3K
C7
C6
C8
420K
R4
120
R10
J14
LOGIC BOARD
J2
R9
3K
R3
2K
R8
10
R7
120K
PACER BOARD
J1
J5
J6
J7
J8
J9

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401444-0000	PCBA, DEFIB MOTHER REV. D (E1201)			A				D	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401443-0000	*1	1	PCB, DEFIB MOTHER REV. B (E1050) - UL/CERTS REQ	B	R	33	1.000	EA	2	Yes		
401564-0000	*1	2	DEFIB FLYBACK XFMR ASSY. REV. A1 (D178)	A1	A	6	1.000	EA	7 T1	Yes		
382000-0037A	**2	1	XFMR, FLYBACK (DEFIB) **CRITICAL** REV. A2 (D227)	A2	R	22	1.000	EA	1 T1	Yes		
378000-0053A	**2	2	DIO, 50mA,15kV,AX		R	22	1.000	EA	2	Yes		
354000-0256A	**2	3	CONN,R/A,QCK DISCON,22-18 AWG,FULL INSUL.205x.02TAB		R	22	1.000	EA	3	Yes		
399000-0018A	**2	4	WIRE, HIGH VOLT,20AWG,15kV,WHT,150 DEG C,UL(SILIC)		R	22	0.300	FT	4 (3.5" LG)	Yes		
385000-0032A	**2	5	ADHESIVE, STRUCTURAL 2 PART EPOXY		R	22	0.000	EA	AS REQUIRED-NO ISSUE	Yes		
385000-0014A	**2	6	SHRINK TUBING, 3/16 IN CLR UL **CERTS REQUIRED**		R	22	1.500	IN.	6 (1.5" LG)	Yes		
385000-0008A	**2	7	SHRINK TUBING, 1/4in CLEAR VW-1		R	11	1.000	IN.	7 (1" LG)	Yes		
384000-0134A	**2	8	WIRE IDENTIFICATION MARKER A,B,C (1 PKG)		R	22	0.000	PKG	8 (SIGN OUT OF STOCK)	Yes		
900000	**2	99			L	0	0.000			Yes		
352300-0474A	*1	3	CAP, .47UF, 50V,20%,RAD,MYLAR(METALLIZED POLYESTR)		R	22	1.000	EA	C3	Yes		
354000-0229A	*1	4	CONN, EDGE,50-PIN		R	22	4.000	EA	J1,2,3,4	Yes		
354000-0230A	*1	5	CONN, 2-PIN,STRT LCK,.1 CTR		R	22	1.000	EA	J6	Yes		
354000-0084A	*1	6	CONN, 3-P,M,STRT LCK,.1 CTR		R	11	1.000	EA	J5	Yes		
354000-0231A	*1	7	CONN, 4-P,STRT LCK,.1 CTR		R	22	1.000	EA	J8	Yes		
354000-0232A	*1	8	CONN, 6-P,STRT LCK,.1 CTR		R	22	1.000	EA	J12	Yes		
354000-0250A	*1	9	CONN, HSNG,8-POS,STR,.079 CTR		R	22	2.000	EA	J13,14	Yes		
354000-0085A	*1	10	CONN, 3-PIN,M,STRT LCK,.156 CTR		R	11	1.000	EA	J11	Yes		
354000-0103A	*1	11	CONN, SGL ROW,STRT,SGL PINS,SNAP-AWAY		R	11	11.000	PIN	J7	Yes		
354000-0103A	*1	12	CONN, SGL ROW,STRT,SGL PINS,SNAP-AWAY		R	11	19.000	PIN	J9	Yes		
384000-0132A	*1	13	CARD GUIDE 3"LG		R	22	8.000	EA	3 CG1-8	Yes		
370101-0682A	*1	14	RES, 6.8K,1/8W,5%,CF		R	11	1.000	EA	SEE ECO 1201	Yes		
358100-0023A	*1	15	SCR, 6-32 X 1/2,PH PNHD STEEL, ZINC, OR S.S.		R	11	8.000	EA	1	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401444-0000	PCBA, DEFIB MOTHER REV. D (E1201)			A				D	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
364000-0175A	*1	16	IC, PC219,PHOTOCOUPLER,MINI-FLAT PKG.		R	22	1.000	EA	SEE ECO 1201	Yes		
360500-0038A	*1	18	NUT, #6-32,ELASTIC STOP,THIN PTTRN		R	11	8.000	EA	6	Yes		
354000-0141A	*1	25	CONN, 2-P,M,STRT LOCK,.156 CTR,HDR		R	11	1.000	EA	J10	Yes		
352300-0020A	*1	28	CAP., 1UF,63V,5%,MYLAR		R	77	2.000	EA	C1,C2	Yes		
352200-0226A	*1	29	CAP, 22UF,35V,RAD,ELECT		R	22	1.000	EA	C4	Yes		
352201-0228A	*1	30	CAP, 2200UF,35V,AX,ELECT, 16X30MM		R	66	1.000	EA	C5	Yes		
352300-0473A	*1	31	CAP, .047UF,50V,20%,MYLAR		R	22	4.000	EA	C6,7,8,9	Yes		
378000-0002A	*1	32	DIO, 1N4002GP,RCTFR, (MOT ONLY) T&R		R	11	1.000	EA	D1	Yes		
370100-0203A	*1	34	RES, 20K,1/4W,5%,CF		R	11	1.000	EA	R1	Yes		
370100-0302A	*1	35	RES, 3K,1/4W,5%,CF		R	11	3.000	EA	R2,5,9	Yes		
370100-0202A	*1	36	RES, 2K,1/4W,5%,CF		R	11	1.000	EA	R3	Yes		
370100-0474A	*1	37	RES, 470K,1/4W,5%,CF		R	11	1.000	EA	R4	Yes		
370100-0103A	*1	38	RES, 10K,1/4W,5%,CF		R	11	2.000	EA	R6,R11	Yes		
370100-0100A	*1	40	RES, 10,1/4W,5%,CF		R	11	1.000	EA	R8	Yes		
370100-0121A	*1	41	RES, 120,1/4W,5%,CF		R	11	2.000	EA	R7,10	Yes		
401627-0000	*1	51	SHIELD, FLYBACK 2 OZ 94V-		R	22	1.000	EA		Yes		

DEFIBRILLATOR POWER BOARD

CHAPTER 4

4.0.0 DEFIBRILLATOR POWER BOARD

4.1.0 DEFIBRILLATOR RAW POWER

AC power is input into the defibrillator through the power input module on the rear panel of the defibrillator. This AC power is fed through the step down power transformer and then input to the defibrillator power board where the AC power is rectified at BR1 for AC operation only, i.e. when the battery has been removed from the defibrillator, voltage is supplied through C10, L1 and C1 for filtering and through diodes BR2 and out VS (voltage source). For battery operation, voltage is supplied through F1 (battery fuse) and through diodes BR3 to VS.

4.2.0 BATTERY CHARGING

Battery charging is supplied through voltage regulator U1 and current regulator U2. Charging current is limited to 440 ma through U2B. U2A detects battery charging current. If the charging current draw is greater than 40 ma the battery charge light is turned on, U2B is switched on and the battery will be charged. The battery charge voltage is adjusted through VR1 to 14.85 volts with approximately 150 mA load at room temperature. When the charging current drops below 40 mA, the charge voltage will automatically drop to 13.9 volts in "stand by" mode thus adjusting the current output of U1. Note: (battery level sensing and display is accomplished through U6 of the defibrillator isolation board). Transistor Q1 will turn off battery charging when the defibrillator is charging the storage capacitor.

4.3.0 PRE-CHARGING

Before the defibrillator can begin charging the storage capacitor, the dump relay must be in the correct state (normally open). The state of the dump relay is sensed at comparator U6A. The dump relay is transferred into the correct state by the darlington transistor Q3. When the dump relay is in the open state, Pin 4 of the pulse width modulator will be enabled by turning off Q4 and the defibrillator charging begins. To prevent the storage capacitor from charging above 4.75kV, a safety circuit senses the charge on the storage capacitor from the relay board and feeds to buffer U5B and comparator U6C. Another safety circuit condition which must be met is to assure the energy select is not greater then 50 joules with internal paddles connected. This condition is sensed through comparator U6D. Comparator U6C and U6D form a safety lock out circuit through U6B to clamp

off pin 12 of U7, thus inhibiting the charging circuit. Pin 4 of U7, when high, inhibits the oscillator within U7 from latching off the internal PWM comparator preventing current from flowing out pin 1 drive. pin 12 of U7, when low, will inhibit start-up of U7, preventing output from pin 1 drive to flyback.

A third sensing condition which must be met before charging the storage capacitor, is the status of the energy transfer relay in the open state (non-active mode). This state is sensed through pin 2 of comparator U3A and Pin 1 of the logic PCBA. When energy discharge is activated, XFR-CTRL (Pin 4 of edge connector J2) signal switches to high and drives the energy transfer relay through transistor, Q2.

4.4.0 DEFIBRILLATOR CHARGING

The charge input is initiated through the logic PCBA. Once all the conditions are met by the above described logic and the charge key is pressed, U7 will switch on and drive the flyback transformer through pin 1, with an approximate 21 kHz signal. The charge time for charging the storage capacitor is adjusted at VR3. This charge time adjustment is critical to prevent over driving the MOSFET Q5 and the flyback transformer. SW1 is a service switch located between R39 and the MOSFET Q5 to disable the charge circuit during servicing. This disables charging of the storage capacitor. C20, C21, R40, R46, D13 and D14 act as a snubber circuit to reduce noise in the high voltage charging circuit. NOTE: All logic conditions, detected on the logic board must be met before the power board can begin charging the storage capacitor.

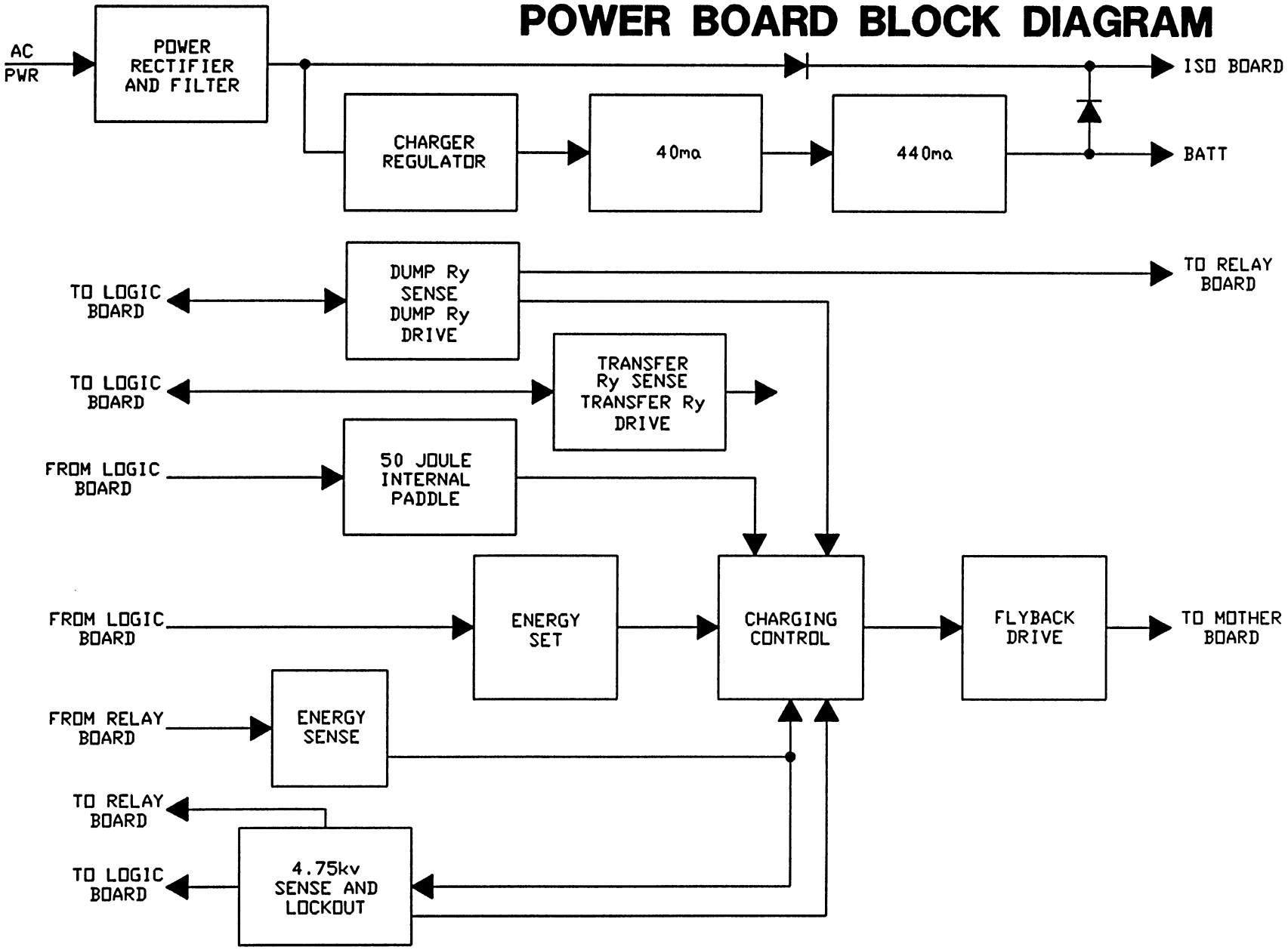
4.5.0 CHARGING ENERGY DETERMINATION

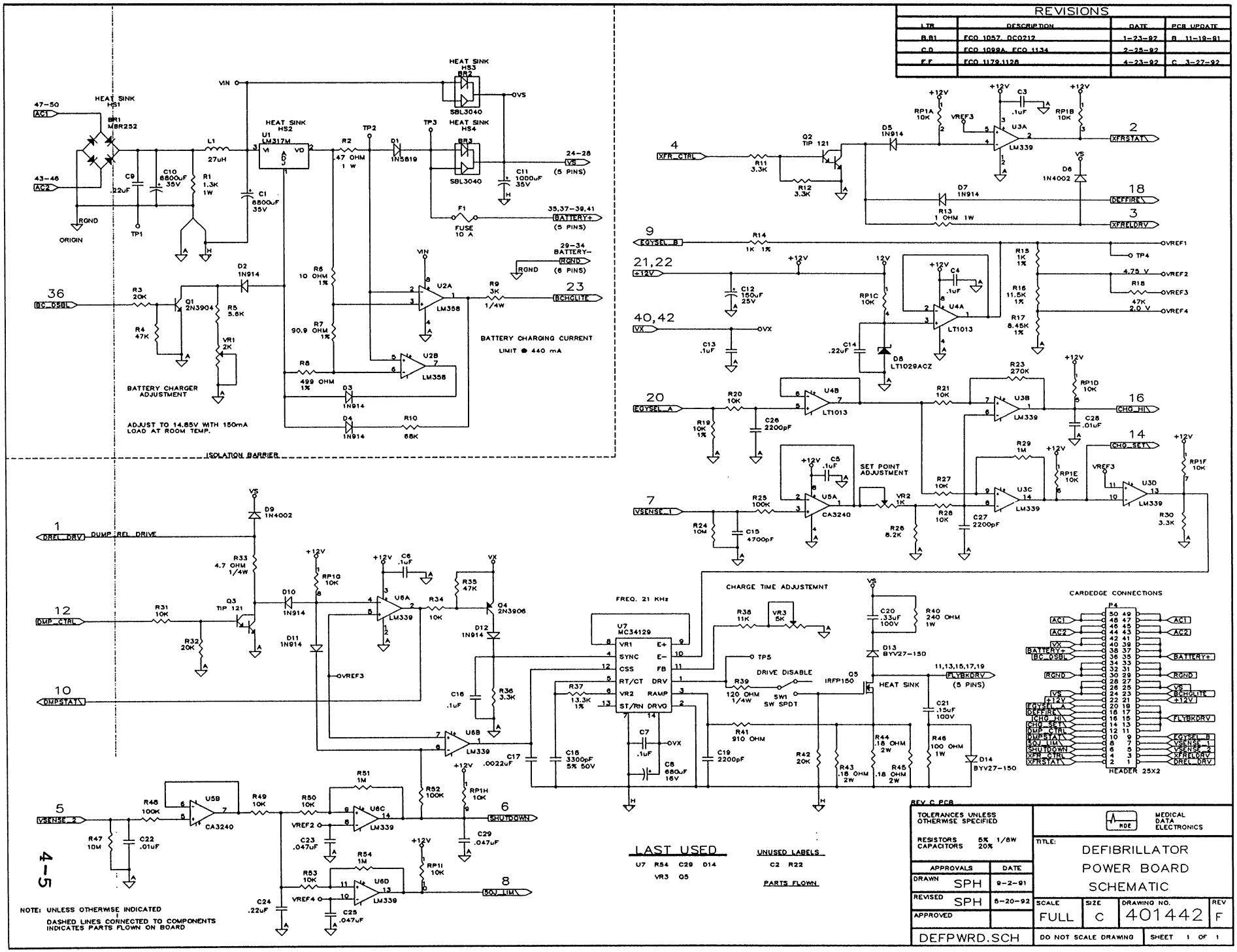
Energy select is set through the front panel and through the logic PCBA pin 22 and pin 24 and input on the power PCBA pin 20. The desired energy output level signal passes through buffer U4B to comparator U3B. Charge sensing for the set point is accommodated through pin 7 (v sense) and through buffer U5A and sensed at comparator U3C. The set point adjustment for calibration is VR2. Comparator U3C senses the set point of energy selection and the actual charge level of the storage capacitor. When charging has reached the energy select set point, the charging circuit is turned off at comparator U3D and U7 pin 10. Simultaneous with the switching off of U7, a signal from the inverting input of comparator U3D is sent to pin 14 of the power PCBA connector to the logic PCBA to start the "charged" beep tone and LED. Comparator U3B also senses the storage capacitor charge level and compares this to the energy level selected. If the charge level of the

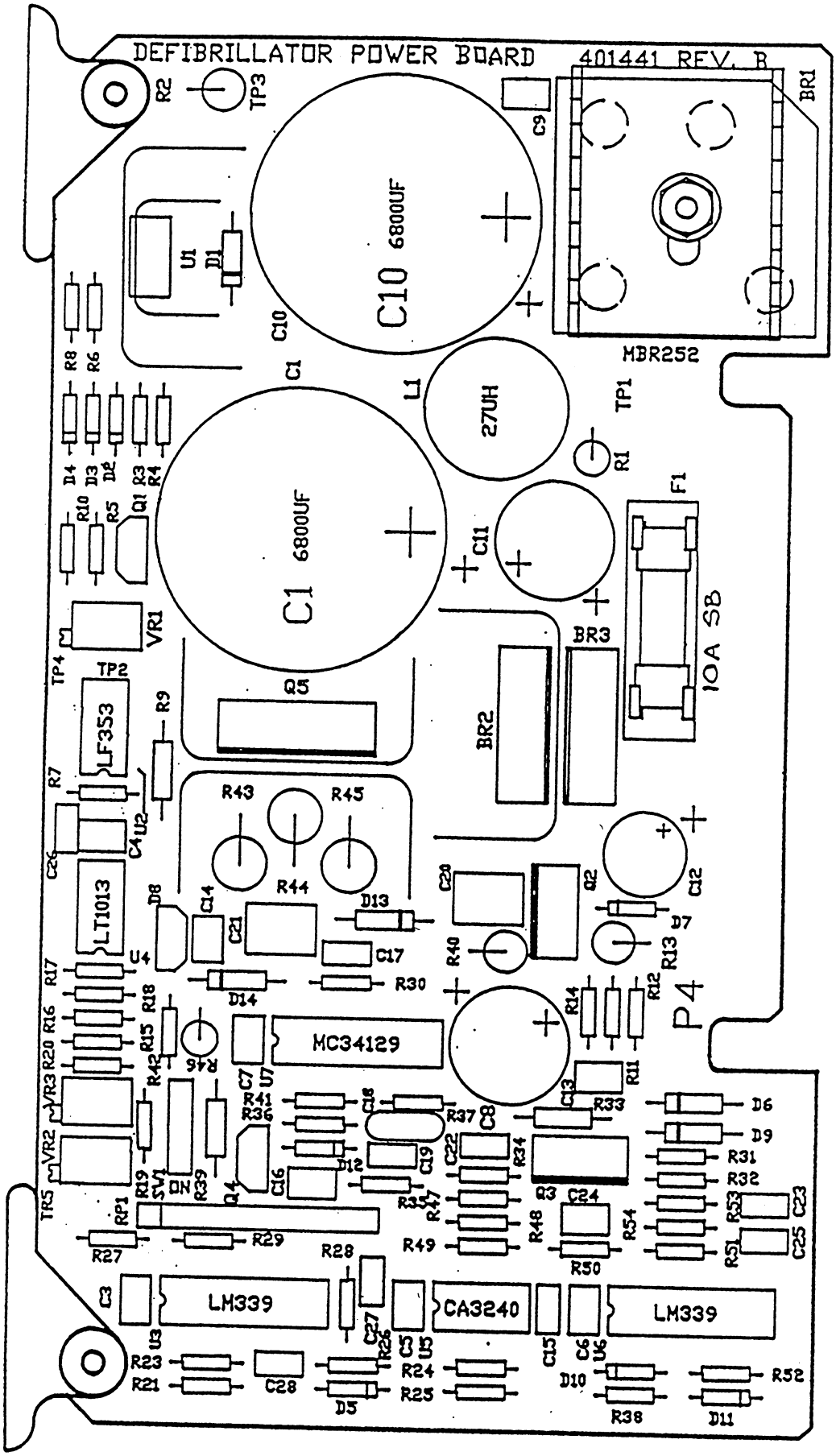
storage capacitor is greater than the energy level selected, the dump relay will be energized momentarily to dump the stored energy and then the charge circuit will charge up to the correct energy level. Note this is the case when the defibrillator is charged to a selected energy level, then a new lower energy level is selected.

A precision 5.0 volts reference is generaged by operational amplifier U4A and reference diode D8. The reference voltage output U4A pin 1 feeds the energy selector via R14 and also being fed through voltage divider R15, R16, and R17 to form various reference voltages for other uses.

POWER BOARD BLOCK DIAGRAM




REVISIONS
LTR | DESCRIPTION | DATE | PCB UPDATE
B,B1 | ECO 1057, DC0212 | 1-23-92 | B 11-19-91
C,D | ECO 1098A, ECO 1134 | 2-25-92 |
E,F | ECO 1179,1128 | 4-23-92 | C 3-27-92
ISOLATION BARRIER
BATTERY CHARGER ADJUSTMENT
ADJUST TO 14.85V WITH 150mA LOAD AT ROOM TEMP.
BATTERY CHARGING CURRENT LIMIT @ 440 mA
SET POINT ADJUSTMENT
CHARGE TIME ADJUSTEMNT
FREQ. 21 KHz
DRIVE DISABLE
CARDEDGE CONNECTIONS
HEADER 25X2
NOTE: UNLESS OTHERWISE INDICATED
DASHED LINES CONNECTED TO COMPONENTS INDICATES PARTS FLOWN ON BOARD
LAST USED
U7 R54 C29 D14
VR3 Q5
UNUSED LABELS
C2 R22
PARTS FLOWN
REV C PCB
TOLERANCES UNLESS OTHERWISE SPECIFIED
RESISTORS 5% 1/8W
CAPACITORS 20%
APPROVALS | DATE
DRAWN SPH 9-2-91
REVISED SPH 6-20-92
APPROVED
DEFPWRD.SCH
MEDICAL DATA ELECTRONICS
TITLE: DEFIBRILLATOR POWER BOARD SCHEMATIC
SCALE FULL | SIZE C | DRAWING NO. 401442 | REV F
DO NOT SCALE DRAWING | SHEET 1 OF 1
4-5


DEFIBRILLATOR POWER BOARD 401441 REV. B
C10 6800UF
C1 6800UF
27UH
MBR252
10A SB
MC34129
LM339
CA3240
LM339
LF353
LT1013
P4

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401442-0000	PCBA, DEFIB POWER REV. F (E1128A)			A				F	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401441-0000	*1	1	PCB, DEFIB POWER REV. C (E1163) - UL/CERTS REQ	C	R	33	1.000	EA	-	Yes		
384000-0155A	*1	2	CARD EJECTOR		R	22	2.000	EA	BE1,BE2	Yes		
378000-0048A	*1	3	DIO, MBR252,25A,200V,BRID GE RECTFR		R	33	1.000	EA	BR1	Yes		
378000-0055A	*1	4	DIO, SBL3040PT,30A,40V,PI V,SCHOTTKY RECT.		R	22	2.000	EA	BR2,BR3	Yes		
352200-0688A	*1	5	CAP, 6800uF,35V,20%,LOW P ROFILE,ELECT.		R	22	2.000	EA	C1,10	Yes		
352300-0104A	*1	6	CAP, .1UF,50V,20%,RAD,MYL AR		R	22	7.000	EA	C3,4,5,6,7,13,16	Yes		
352200-0687A	*1	7	CAP, 680uF,16V,20%,LOW PR OFILE,ELECT(12.5x15mm)		R	22	1.000	EA	C8	Yes		
352300-0224A	*1	8	CAP, .22UF,50V,20%,MYLAR		R	22	3.000	EA	C9,14,24	Yes		
352202-0108A	*1	9	CAP, 1000uF,35V,20%,ELECT ,RAD		R	22	1.000	EA	C11	Yes		
352200-0157A	*1	10	CAP, 150uF,25V,20%,RAD,EL ECT,8mm x 12mm		R	66	1.000	EA	C12	Yes		
352300-0472A	*1	11	CAP, 4700pF,50V,20%,MYLAR		R	22	1.000	EA	C15	Yes		
352301-0222A	*1	12	CAP, 2200PF,100V,20%,MYLA R		R	22	4.000	EA	C17,19,26,27	Yes		
352301-0332A	*1	13	CAP,.0033UF,50V,5%,RAD,MY LAR,.1 LS SORT352300-0332		R	22	1.000	EA	C18	Yes		
352300-0334A	*1	14	CAP, 0.33uF,100V,20%,MYL		R	22	1.000	EA	C20	Yes		
352301-0154A	*1	15	CAP, 0.15uF,100V,20%,MYL		R	22	1.000	EA	C21	Yes		
352300-0103A	*1	16	CAP, .01UF,50V,20%,RAD,MY LAR		R	22	2.000	EA	C22,28	Yes		
352300-0473A	*1	17	CAP, .047UF,50V,20%,MYLAR		R	22	3.000	EA	C23,25,29	Yes		
378000-0036A	*1	18	DIO, 1N5819,1AMP,SCHOTTKY T&R		R	11	1.000	EA	D1	Yes		
378000-0005A	*1	19	DIO, 1N914,SIGNAL T&R		R	11	8.000	EA	D2,3,4,5,7,10,11,12	Yes		
378000-0002A	*1	20	DIO, 1N4002GP,RCTFR, (MOT ONLY) T&R		R	11	2.000	EA	D6,9	Yes		
378000-0043A	*1	21	DIO, LT1029ACZ,5V,PRES		R	22	1.000	EA	D8	Yes		
378000-0041A	*1	22	DIO, BYV27-200 T&R		R	22	2.000	EA	D13,14	Yes		
360300-0024A	*1	23	FUSE, 10.0 AMP,5 x 20mm		R	22	1.000	EA	F1	Yes		
382200-0031A	*1	24	INDCTR, 27uH POWER LINE		R	22	1.000	EA	L1	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401442-0000	PCBA, DEFIB POWER REV. F (E1128A)			A				F	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
376000-0003A	*1	25	XSTR, 2N3904		R	11	1.000	EA	Q1	Yes		
376000-0009A	*1	26	XSTR, TIP121,DARLINGTON P WR		R	11	2.000	EA	Q2,3	Yes		
376000-0011A	*1	27	XSTR, 2N3906,SIGNAL		R	11	1.000	EA	Q4	Yes		
376000-0027A	*1	28	XSTR, IRFP150,NCHANNEL PO WER MOSFET		R	22	1.000	EA	Q5	Yes		
370300-0007A	*1	29	RES, SIP,10K,10-P,NTWK		R	11	1.000	EA	RP1	Yes		
370201-0132A	*1	30	RES, 1.3K,1W,5%.M.O.		R	22	1.000	EA	R1	Yes		
370201-4700A	*1	31	RES, 0.47,1W,M.O.		R	11	1.000	EA	R2	Yes		
370101-0203A	*1	32	RES, 20K,1/8W,5%,CF		R	11	3.000	EA	R3,32,42	Yes		
370101-0473A	*1	33	RES, 47K,1/8W,5%,CF		R	11	3.000	EA	R4,18,35	Yes		
370101-0562A	*1	34	RES, 5.6K,1/8W,5%,CF		R	11	1.000	EA	R5	Yes		
370202-1000A	*1	35	RES, 10,1/8W,1%,MF		R	22	1.000	EA	R6	Yes		
370202-9090A	*1	36	RES, 90.9,1/8W,1%,MF		R	22	1.000	EA	R7	Yes		
370202-4990A	*1	37	RES, 499,1/8W,1%,MF		R	22	1.000	EA	R8	Yes		
370100-0302A	*1	38	RES, 3K,1/4W,5%,CF		R	11	1.000	EA	R9	Yes		
370101-0683A	*1	39	RES, 68K,1/8W,5%,CF		R	22	1.000	EA	R10	Yes		
370101-0332A	*1	40	RES, 3.3K,1/8W,5%,CF		R	22	4.000	EA	R11,12,30,36	Yes		
370201-0010A	*1	41	RES, 1,1W,M.O.		R	11	1.000	EA	R13	Yes		
370202-1001A	*1	42	RES, 1.0K,1/8W,1%,MF		R	22	2.000	EA	R14,15	Yes		
370202-1152A	*1	43	RES, 11.5K,1/8W,1%,MF		R	22	1.000	EA	R16	Yes		
370202-8451A	*1	44	RES, 8.45K,1/8W,1%,MF		R	22	1.000	EA	R17	Yes		
370202-1002A	*1	45	RES, 10K,1/8W,1%,MF		R	22	1.000	EA	R19	Yes		
370101-0103A	*1	46	RES, 10K,1/8W,5%,CF		R	11	7.000	EA	R20,21,27,28,31,34,49	Yes		
370101-0103A	*1	47	RES, 10K,1/8W,5%,CF		R	11	2.000	EA	R50,53	Yes		
370101-0104A	*1	48	RES, 100K,1/8W,5%,CF		R	11	3.000	EA	R25,48,52	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401442-0000	PCBA, DEFIB POWER REV. F (E1128A)			A				F	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370101-0106A	*1	49	RES, 10M,1/8W,5%,CF		R	11	2.000	EA	R24,47	Yes		
370101-0822A	*1	50	RES, 8.2K,1/8W,5%,CF		R	11	1.000	EA	R26	Yes		
370101-0105A	*1	51	RES, 1M,1/8W,5%,CF		R	11	3.000	EA	R29,51,54	Yes		
370100-0047A	*1	52	RES, 4.7,1/4W,5%,CF		R	11	1.000	EA	R33	Yes		
370202-1332A	*1	53	RES, 13.3K,1/8W,1%		R	11	1.000	EA	R37	Yes		
370101-0113A	*1	54	RES, 11K,1/8W,5%,CF		R	11	1.000	EA	R38	Yes		
370100-0121A	*1	55	RES, 120,1/4W,5%,CF		R	11	1.000	EA	R39	Yes		
370201-0241A	*1	56	RES, 240,1W,M.O.		R	11	1.000	EA	R40	Yes		
370101-0911A	*1	57	RES, 910,1/8W,5%,CF		R	22	1.000	EA	R41	Yes		
370203-1500A	*1	58	RES, 0.18,2W,5%,350V,M.O.		R	22	3.000	EA	R43,44,45	Yes		
380000-0029A	*1	60	SW, 1K2 DPST SUBMIN,CKTBD MOUNT		R	22	1.000	EA	SW1	Yes		
364000-0195A	*1	62	IC, LM317M,3-TERM,ADJ,POS VOLT REG		R	22	1.000	EA	U1	Yes		
364000-0011A	*1	63	IC, LM358		R	11	1.000	EA	U2	Yes		
364000-0010A	*1	64	IC, LM339		R	11	2.000	EA	U3,6	Yes		
364000-0136A	*1	65	IC, LT1013,OP AMP		R	33	1.000	EA	U4	Yes		
364000-0004A	*1	66	IC, CA3240		R	11	1.000	EA	U5	Yes		
364000-0193A	*1	67	IC, 34129,CURRENT MODE CONTROLLER		R	22	1.000	EA	U7	Yes		
374402-0202A	*1	68	POT, 2K,10-TURN,SIDE ADJ		R	22	1.000	EA	VR1	Yes		
374402-0102A	*1	69	POT, 1K,10-TURN,SIDE ADJ		R	22	1.000	EA	VR2	Yes		
360600-0046A	*1	70	HEATSINK, TO-202 & TO-220		R	22	1.000	EA	70	Yes		
360600-0056A	*1	71	HTSNK, 57668-TT,TO221 CKT BD MOUNT		R	22	2.000	EA	71	Yes		
360600-0037A	*1	72	HTSNK, 5750 BTT		R	33	3.000	EA	72	Yes		
360300-0007A	*1	73	FUSE, HLDR		R	22	2.000	EA	73	Yes		
358100-0010A	*1	74	SCR, 4-40 X 1/2,PH PNHD ZINC		R	11	1.000	EA	74 - U1	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
401442-0000	PCBA, DEFIB POWER REV. F (E1128A)			A			F	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
358100-0035A	*1	75	SCR, 4-40 X 7/8,PH FLTHD, BLK OX,82 DEG		R	11	1.000	EA	82 - BR1	Yes		
358200-0004A	*1	76	WSHR, #4 FLAT STL ZINC,(.125ID,9/32OD,.025THK)		R	11	3.000	EA	76 - U1, BR1	Yes		
358200-0009A	*1	77	WSHR, #4 SPLIT LOCK		R	11	1.000	EA	77 - U1	Yes		
360500-0022A	*1	79	NUT, #4 HEX,LRG PTTRN		R	11	2.000	EA	79 - U1, BR1	Yes		
358100-0023A	*1	80	SCR, 6-32 X 1/2,PH PNHD STEEL, ZINC, OR S.S.		R	11	1.000	EA	80 - Q5	Yes		
358100-0107A	*1	81	SCR, 6-32 X 5/8" PHPNHD ZINC PLTD		R	22	1.000	EA	81 - BR2/BR3	Yes		
370101-0274A	*1	88	RES, 270K,1/8W,5%,CF		R	11	1.000	EA	R23	Yes		
370201-0101A	*1	89	RES, 100,1W,M.O.		R	11	1.000	EA	R46	Yes		
360500-0038A	*1	90	NUT, #6-32,ELASTIC STOP,THIN PTTRN		R	11	1.000	EA	84	Yes		
100000	*1	91	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR ASSEMBLY	Yes		
100000	*1	92	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR C1 & C10, INSTALL	Yes		
100000	*1	93	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	SHORTER CAP AT C10	Yes		
100000	*1	94	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	POSITION.	Yes		
374402-0502A	*1	95	POT, 5K,10-TURN,SIDE ADJ		R	22	1.000	EA	VR3	Yes		

DEFIBRILLATOR ISOLATION PCBA

CHAPTER 5

5.0.0 DEFIBRILLATOR ISOLATION PCBA

5.1.0 POWER ON

IC U4A and U4B set up an electronic system on/off. When supply voltage is first applied (AC or battery), Q3 and Q4 are initially off. When the power on key is pressed, power up is initially accomplished by switching FET Q3 on, thus providing supply voltage VS to the 9 volt regulator U1. Please note point VA as voltage source for regulator, U1. A voltage is fed back from the output of regulator U1 through VX to pin 14 of pulse width modulator U3. Simultaneous with the start up of U1, when the power ON key is pressed, comparator U4A and U4B drive Pin 7 of comparator U4B high until a soft start condition is reached. U3 pin 1 will drive FET Q2 which supplies the power transformer in the power supply. A feed back voltage, VS, from the primary of T1 is fed through D8 to comparator U4A. When VS reaches 12 V, U4A shuts off FET Q3, turning off U1. DC feed back voltage is fed back to pin 10 of pulse width modulator U3, simultaneous with turning on power ON LED.

When STDBY key is pressed, pin 12 of pulse width modulator will be brought low through diode D11, turning off pin 1 drive of U3, and turning off FET Q2 thus shutting down the power supply.

5.2.0 POWER SUPPLY SYNC

A 250 kHz signal is provided by the CPU of the **E300A** and is fed in through pin 5, labeled PS SYNC. This 250 kHz signal is divided by 4 at U2 to provide the pulse width modulator U3 with a 62.5 kHz sync signal. Thus, the drive sync of U3 will be 62.5 kHz.

5.3.0 BATTERY LEVEL DETECTION

When the defibrillator is powered by AC power, AC power is sensed through edge connector pin 49, AC DETECT Q5 and U5D. This signal is input into pin 11 of BCD decoder U6. When AC voltage is detected, the battery detection circuitry is turned off.

Battery level is sensed through comparators U5A and U5B. When pin 6 of U5B is lower than pin 4 of U5A, the battery is in the high condition. When pin 6 of U5B and pin 4 of U5A are equal, the battery is in midrange condition. When pin 6 of U5B is higher than pin 4 of U5A the battery is in low

condition. The battery level is displayed on 3 LED's located on the front panel which are driven through the BCD decimal decoder U6.

5.4.0 ISOLATION POWER SUPPLY

The isolation power supply is driven by transformer secondary pins 2,3, and 4, which are located within the iso barrier section of the PCBA. D6 and C31 rectify and filter positive output voltage (approximately 18 volts), and U10 provides +15 volt regulation. D7 and C32 provide negative voltage and regulation to -15 volts. Pin 3 of transformer T1 provides iso ground.

5.5.0 NON-ISOLATION POWER SUPPLY

The non-isolated power supply is driven by transformer secondary Pins 8, 9, and 10. D4 and C25 rectify and filter positive output voltage +12 volts. D5 and C26 provide negative voltage to -12 volt supply.

5.6.0 PADDLE ECG

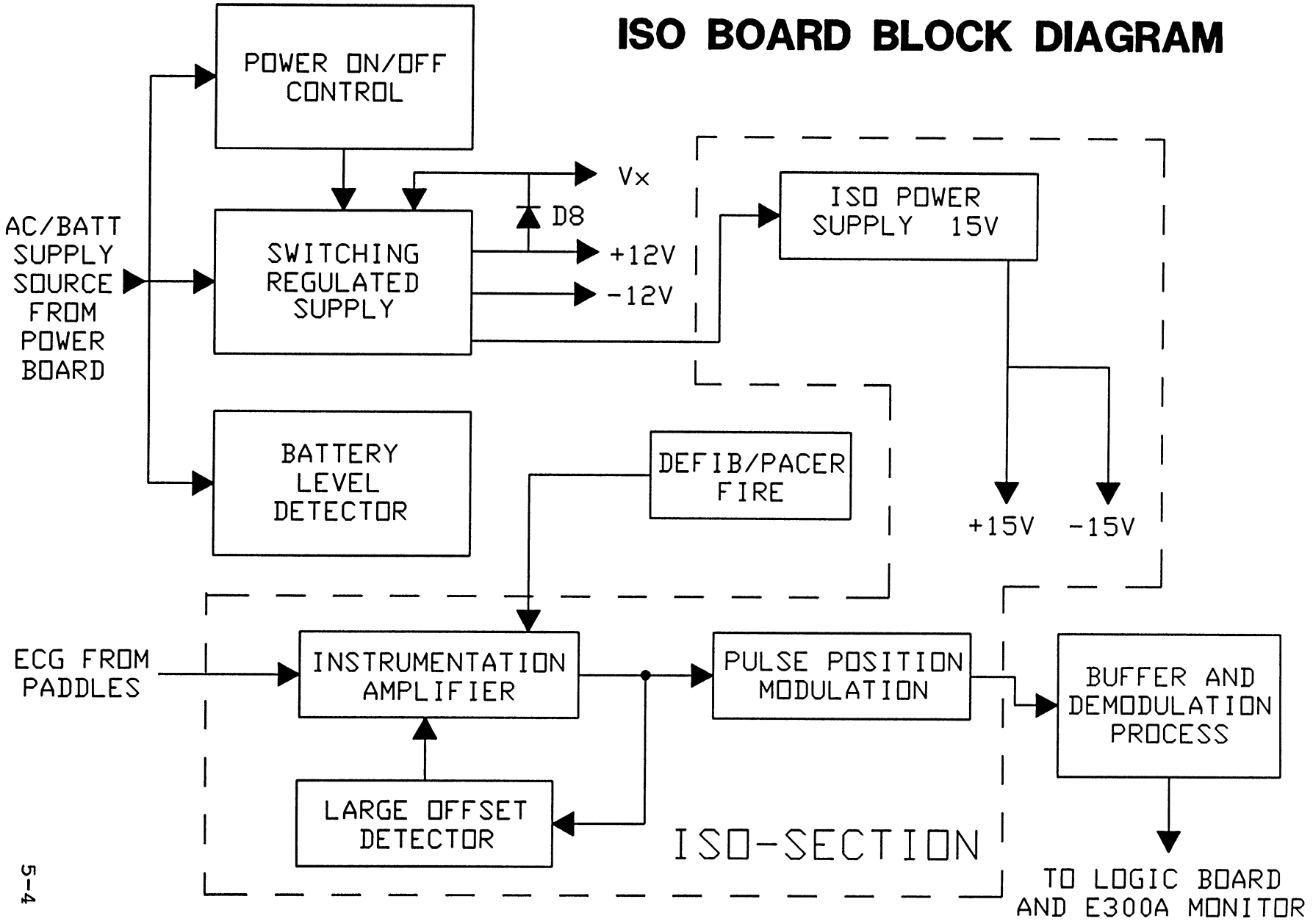
The paddle ECG signal is input through J16 pin 1 and pin 3. Over voltage protection is provided through zener diodes D16, D17, D21, and D22. Amplifiers U7B and U7C offer a differential input to amplify U7A which together, comprises an instrumentation amplifier with 1000 to 1 gain and common mode rejection of greater than 80 db. Common mode rejection calibration is provided by VR1.

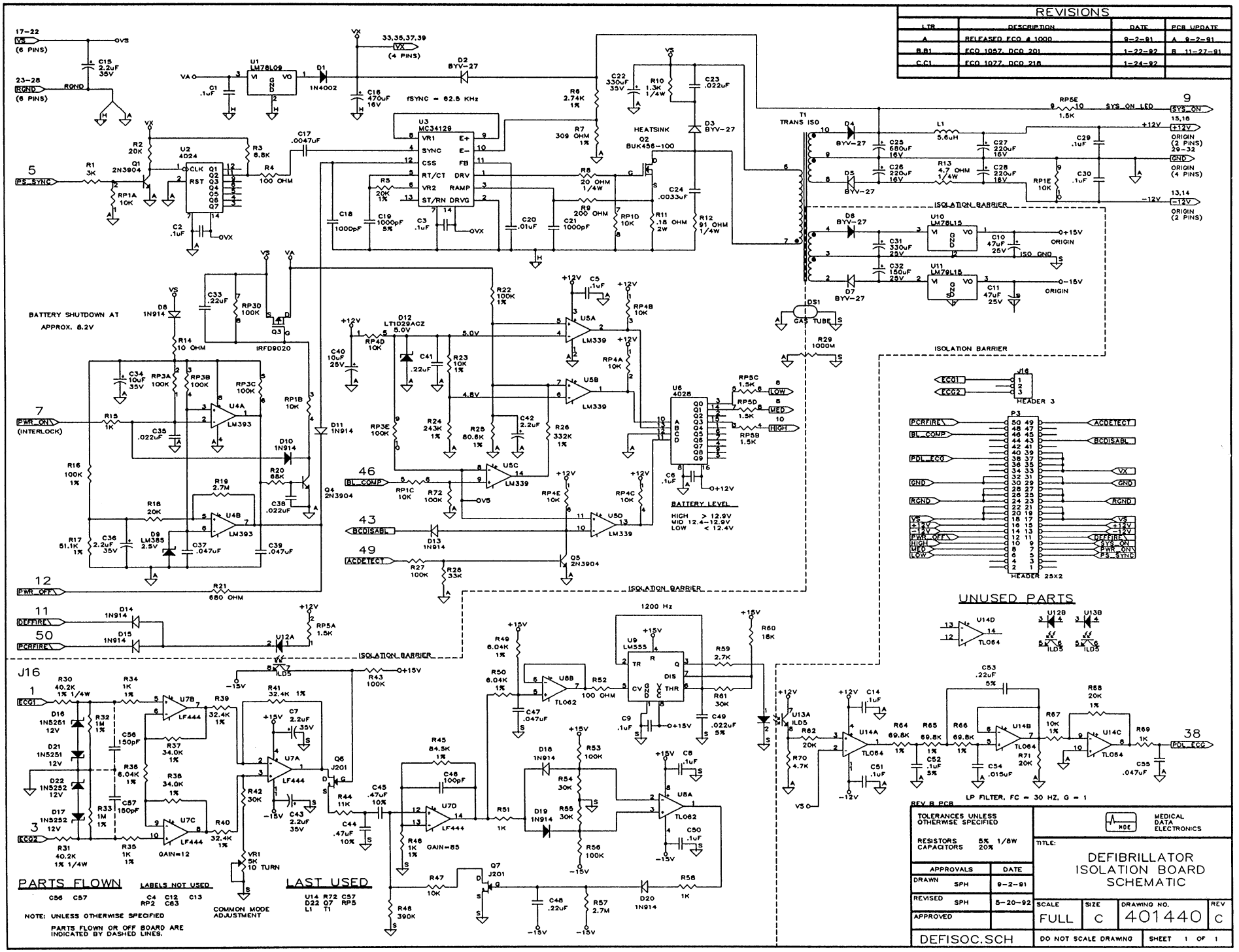
Overdrive protection for this circuit prevents saturation of amplifier U7D. When the defibrillator paddles are discharged, or when the pacemaker circuit pulses. Overdrive protection is provided by opto coupler, U12A and FET Q6. Defibrillator discharge and pacemaker pulse are sensed through D14 and D15 respectively, which drives opto coupler U12A. Opto coupler U12A controls the gating of FET Q6. During defib discharge, or pacemaker pulse, FET Q6 is turned off, thus removing input from pin 12 of amplifier U7D. A second circuit detects a large offset voltage on pin 14 of amplifier U7D. When a large offset voltage appears, a high amplitude spike is output by U8A to the gate of FET Q7 thus turning FET Q7 on and conducting the offset voltage to ISO ground through R47. This action quickly restores U7D to normal operation after saturation.

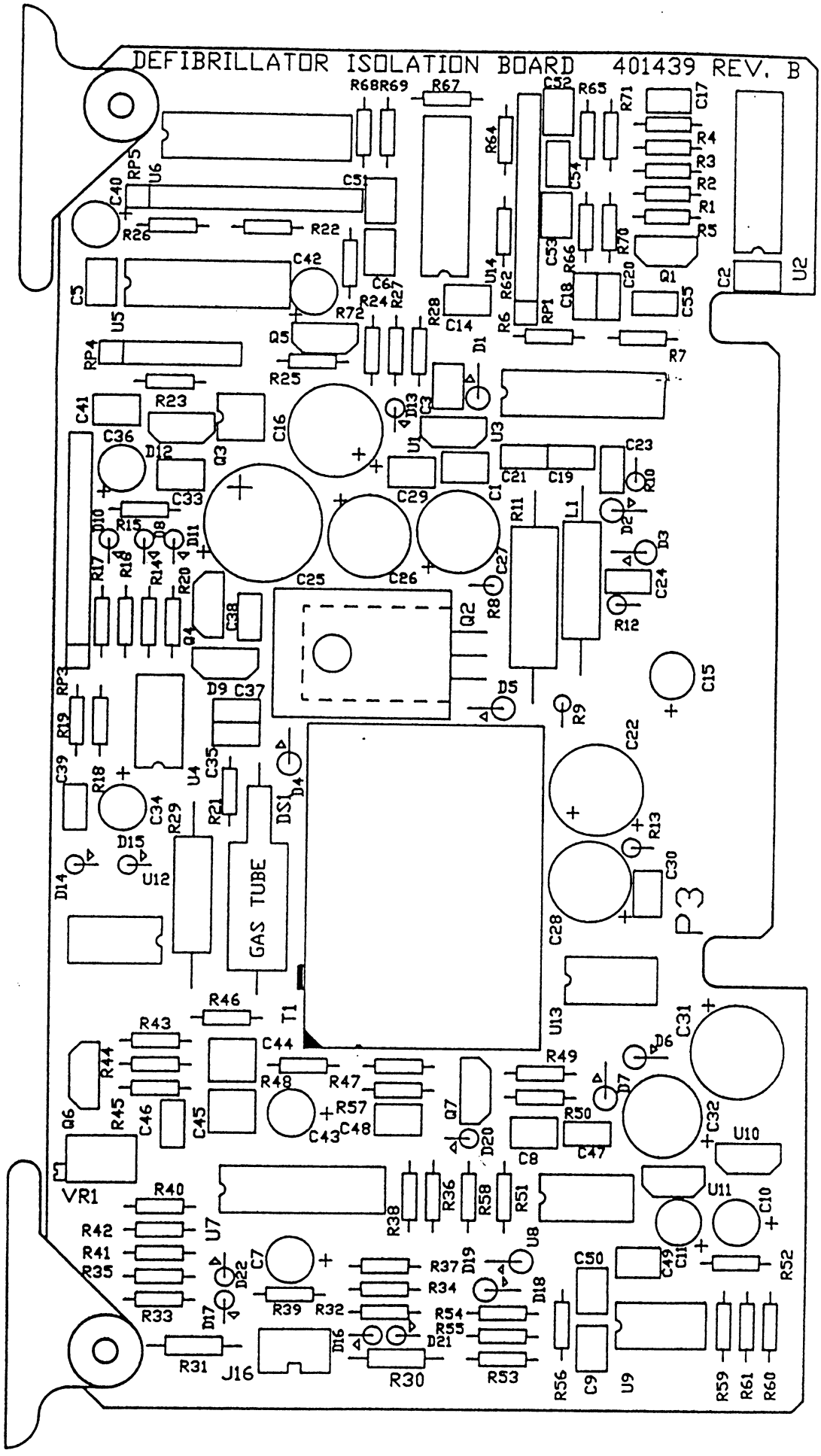
The amplified ECG signal at pin 14 of U7D is input into level shifter U8B. LM555 timer U9 is connected for stable operation, modulating signal from U8B Pin 7 is applied to the

control voltage terminal of U9 (Pin 5). The process is referred to as pulse position modulation. The modulated ECG signal goes through the isolation barrier at U13A where the signal is input into buffer amplifier U14A. It is demodulated by U14B and U14C which provide 3rd order low pass filter and a gain of 2. Then output through pin 38 of iso PCBA as a 1 volt high level ECG analog signal. This high level ECG signal is routed to the **E300A** monitor for display and to the logic PCBA for R wave picking.

ISO BOARD BLOCK DIAGRAM




REVISIONS
LTR | DESCRIPTION | DATE | PCB UPDATE
A | RELEASED ECO # 1000 | 9-2-91 | A 9-2-91
B,B1 | ECO 1057, DCO 201 | 1-22-92 | B 11-27-91
C,C1 | ECO 1077, DCO 218 | 1-24-92 |
17-22 (6 PINS)
23-28 (6 PINS)
33,35,37,39 (4 PINS)
fSYNC = 62.5 KHz
BATTERY SHUTDOWN AT APPROX. 8.2V
ISOLATION BARRIER
HEATSINK
GAS TUBE
BATTERY LEVEL
HIGH > 12.9V
MID 12.4-12.9V
LOW < 12.4V
1200 Hz
UNUSED PARTS
PARTS FLOWN
LABELS NOT USED
LAST USED
NOTE: UNLESS OTHERWISE SPECIFIED
PARTS FLOWN OR OFF BOARD ARE INDICATED BY DASHED LINES.
COMMON MODE ADJUSTMENT
LP FILTER, FC = 30 HZ, G = 1
REV B PCB
TOLERANCES UNLESS OTHERWISE SPECIFIED
RESISTORS 5% 1/8W
CAPACITORS 20%
APPROVALS | DATE
DRAWN SPH 9-2-91
REVISED SPH 5-20-92
APPROVED
MEDICAL DATA ELECTRONICS
TITLE: DEFIBRILLATOR ISOLATION BOARD SCHEMATIC
SCALE FULL | SIZE C | DRAWING NO. 401440 | REV C
DEFISOC.SCH | DO NOT SCALE DRAWING | SHEET 1 OF 1


DEFIBRILLATOR ISOLATION BOARD 401439 REV. B
GAS TUBE
P3
J16
VR1

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401440-0000	PCBA, DEFIB ISOLATION REV. D (E1102)			A				D	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401439-0000	*1	1	PCB, DEFIB ISOLATION REV B (E1050) - UL/CERTS REQ	B	R	33	1.000	EA	-	Yes		
352300-0104A	*1	2	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	9.000	EA	C1,2,3,5,6,8,9,14,29	Yes		
352300-0104A	*1	3	CAP, .1UF,50V,20%,RAD,MYLAR		R	22	3.000	EA	C30,50,51	Yes		
352401-0225A	*1	4	CAP, 2.2UF,35V,20%,TANT		R	11	5.000	EA	C7,15,36,42,43	Yes		
352200-0476A	*1	5	CAP, 47UF,25V,RAD,ELECT		R	55	2.000	EA	C10,11	Yes		
352200-0477A	*1	6	CAP, 470UF,16V,ELECT, RAD		R	22	1.000	EA	C16	Yes		
352300-0472A	*1	7	CAP, 4700pF,50V,20%,MYLAR		R	22	1.000	EA	C17	Yes		
352300-0102A	*1	8	CAP, 1000PF,50V,20%,RAD,MYLAR		R	66	2.000	EA	C18,21	Yes		
352300-0010A	*1	9	CAP., .001UF,5%,MYLAR SORT FROM 352300-0007A		R	66	1.000	EA	C19	Yes		
352300-0223A	*1	10	CAP, .022UF,50V,20%,MYLAR		R	22	3.000	EA	C23,35,38	Yes		
352202-0337A	*1	11	CAP, 330UF,35V,10X16MM,ELECT,RAD		R	22	1.000	EA	C22	Yes		
352300-0332A	*1	12	CAP, .0033UF,50V,20%,RAD, MYLAR,.1 L.S.		R	22	1.000	EA	C24	Yes		
352200-0687A	*1	13	CAP, 680uF,16V,20%,LOW PROFILE,ELECT(12.5x15mm)		R	22	1.000	EA	C25	Yes		
352203-0227A	*1	14	CAP, 220uF,16V,20%.RAD,ELECT,8mm x 12mm		R	77	3.000	EA	C26,27,28	Yes		
352203-0337A	*1	15	CAP, 330uF,25V,20%,ELECT		R	22	1.000	EA	C31	Yes		
352200-0157A	*1	16	CAP, 150uF,25V,20%,RAD,ELECT,8mm x 12mm		R	66	1.000	EA	C32	Yes		
352300-0224A	*1	17	CAP, .22UF,50V,20%,MYLAR		R	22	3.000	EA	C33,41,48	Yes		
352401-0106A	*1	18	CAP, 10UF,35V,20%,RAD,TANT		R	11	1.000	EA	C34	Yes		
352300-0473A	*1	19	CAP, .047UF,50V,20%,MYLAR		R	22	4.000	EA	C37,39,47,55	Yes		
352400-0106A	*1	20	CAP, 10UF,25V,20%,RAD,TANT		R	11	1.000	EA	C40	Yes		
352300-0014A	*1	21	CAP, .022UF,5%,MYLAR		R	77	1.000	EA	C49	Yes		
352300-0018A	*1	22	CAP, .47UF,10%,MYLAR		R	66	2.000	EA	C44,45	Yes		
352100-0101A	*1	23	CAP, 100PF,25V,10%,RAD,NP0 - .1 LEAD SPACING		R	11	1.000	EA	C46	Yes		
352301-0104A	*1	24	CAP, .1UF,5%,MYLAR		R	66	1.000	EA	C52	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	Ll
401440-0000	PCBA, DEFIB ISOLATION REV. D (E1102)			A			D	

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
352300-0016A	*1	25	CAP, .22UF,5%,MYLAR		R	77	1.000	EA	C53	Yes		
352301-0153A	*1	26	CAP, .015UF,50V,20%,RAD,MYLAR		R	22	1.000	EA	C54	Yes		
384000-0061A	*1	27	GAS TUBE (SURGE ARRESTER)		R	33	1.000	EA	DS1	Yes		
378000-0002A	*1	28	DIO, 1N4002GP,RCTFR, (MOT ONLY) T&R		R	11	1.000	EA	D1	Yes		
378000-0041A	*1	29	DIO, BYV27-200 T&R		R	22	6.000	EA	D2,3,4,5,6,7	Yes		
378000-0005A	*1	30	DIO, 1N914,SIGNAL T&R		R	11	6.000	EA	D8,10,13,14,15,20	Yes		
378000-0034A	*1	31	DIO, LM385,ZENER (XSTR NATIONAL ONLY)		R	11	1.000	EA	D9	Yes		
378000-0043A	*1	32	DIO, LT1029ACZ,5V,PRES		R	22	1.000	EA	D12	Yes		
378000-0051A	*1	33	DIO, 1N5251,12V,ZENER		R	33	4.000	EA	D16,17,21,22	Yes		
378000-0005A	*1	34	DIO, 1N914,SIGNAL T&R		R	11	2.000	EA	D18,19	Yes		
354000-0253A	*1	35	CONN, HSNG,3-POS,STR,.079 CTR		R	22	1.000	EA	J16	Yes		
382200-0032A	*1	36	INDCTR, 5.6uH,2A,20%,L.S. 0.7		R	22	1.000	EA	L1	Yes		
376000-0003A	*1	37	XSTR, 2N3904		R	11	3.000	EA	Q1,4,5	Yes		
376000-0017A	*1	38	XSTR, BUK456-100A,100V,24A,PWR (TO-220)MOSFET ONLY		R	22	1.000	EA	Q2	Yes		
376000-0022A	*1	39	XSTR, IRFD9020,PWR MOSFET		R	33	1.000	EA	Q3	Yes		
376000-0020A	*1	40	XSTR, J201,FET		R	11	2.000	EA	Q6,7	Yes		
370300-0008A	*1	41	RES, SIP,10K,5%,SEPARATE COMP,10-PIN-5-COMP,NTWRK		R	22	1.000	EA	RP1	Yes		
370300-0010A	*1	43	RES, SIP,100K,5%,ISOLATED ,10-PIN,5-COMP,NETWRK		R	22	1.000	EA	RP3	Yes		
370300-0011A	*1	44	RES, SIP,10K,5%,COMMON,6-PIN,5-COMP,NETWRK		R	22	1.000	EA	RP4	Yes		
370300-0012A	*1	45	RES, SIP,1.5K,5%,ISOLATED ,10-PIN,5-COMP,NETWRK		R	22	1.000	EA	RP5	Yes		
370101-0302A	*1	46	RES, 3K,1/8W,5%,CF		R	11	1.000	EA	R1	Yes		
370101-0203A	*1	47	RES, 20K,1/8W,5%,CF		R	11	4.000	EA	R2,18,62,71	Yes		
370101-0682A	*1	48	RES, 6.8K,1/8W,5%,CF		R	11	1.000	EA	R3	Yes		
370101-0101A	*1	49	RES, 100,1/8W,5%,CF		R	11	2.000	EA	R4,52	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401440-0000	PCBA, DEFIB ISOLATION REV. D (E1102)			A				D	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370202-2002A	*1	50	RES, 20K,1/8W,1%,MF		R	22	2.000	EA	R5,68	Yes		
370202-2741A	*1	51	RES, 2.74K,1/8W,1%,MF		R	22	1.000	EA	R6	Yes		
370202-3090A	*1	52	RES, 309,1/8W,1%,MF		R	22	1.000	EA	R7	Yes		
370100-0200A	*1	53	RES, 20,1/4W,5%,CF		R	11	1.000	EA	R8	Yes		
370101-0201A	*1	54	RES, 200,1/8W,5%,CF		R	22	1.000	EA	R9	Yes		
370100-0132A	*1	55	RES, 1.3K,1/4W,5%,CF		R	11	1.000	EA	R10	Yes		
370203-1500A	*1	56	RES, 0.18,2W,5%,350V,M.O.		R	22	1.000	EA	R11	Yes		
370100-0910A	*1	57	RES, 91,1/4W,5%,CF		R	11	1.000	EA	R12	Yes		
370100-0047A	*1	58	RES, 4.7,1/4W,5%,CF		R	11	1.000	EA	R13	Yes		
370101-0100A	*1	59	RES, 10,1/8W,5%,CF		R	22	1.000	EA	R14	Yes		
370101-0102A	*1	60	RES, 1K,1/8W,5%,CF		R	11	4.000	EA	R15,51,58,69	Yes		
370202-1003A	*1	61	RES, 100K,1/8W,1%,MF		R	22	2.000	EA	R16,22	Yes		
370202-5112A	*1	62	RES, 51.1K,1/8W,1%,MF		R	22	1.000	EA	R17	Yes		
370101-0275A	*1	63	RES, 2.7M,1/8W,5%,CF		R	11	2.000	EA	R19,57	Yes		
370101-0683A	*1	64	RES, 68K,1/8W,5%,CF		R	22	1.000	EA	R20	Yes		
370101-0681A	*1	65	RES, 680,1/8W,5%,CF		R	11	1.000	EA	R21	Yes		
370202-1002A	*1	67	RES, 10K,1/8W,1%,MF		R	22	2.000	EA	R23,67	Yes		
370202-2433A	*1	68	RES, 243K,1/8W,1%,MF		R	22	1.000	EA	R24	Yes		
370202-8062A	*1	69	RES, 80.6K,1/8W,1%,MF		R	11	1.000	EA	R25	Yes		
370202-3323A	*1	70	RES, 332K,1/8W,1%,MF		R	11	1.000	EA	R26	Yes		
370101-0104A	*1	71	RES, 100K,1/8W,5%,CF		R	11	5.000	EA	R27,43,53,56,72	Yes		
370101-0333A	*1	72	RES, 33K,1/8W,5%,CF		R	22	1.000	EA	R28	Yes		
370401-0108A	*1	73	RES, 1000M,1W,5%,2500V		R	66	1.000	EA	R29	Yes		
370200-4022A	*1	74	RES, 40.2K,1/4W,1%,MF		R	11	2.000	EA	R30,31	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401440-0000	PCBA, DEFIB ISOLATION REV. D (E1102)			A				D	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370101-0394A	*1	75	RES, 390K,1/8W,5%,CF		R	11	1.000	EA	R48	Yes		
370202-0105A	*1	76	RES, 1.0M,1/8W,1%,MF		R	22	2.000	EA	R32,33	Yes		
370202-3402A	*1	78	RES, 34.0K,1/8W,1%,MF		R	22	2.000	EA	R37,38	Yes		
370202-3242A	*1	79	RES, 32.4K,1/8W,1%,MF		R	22	3.000	EA	R39,40,41	Yes		
370101-0303A	*1	80	RES, 30K,1/8W,5%,CF		R	11	4.000	EA	R42,54,55,61	Yes		
370101-0113A	*1	81	RES, 11K,1/8W,5%,CF		R	11	1.000	EA	R44	Yes		
370202-8452A	*1	82	RES, 84.5K,1/8W,1%,MF		R	22	1.000	EA	R45	Yes		
370101-0103A	*1	84	RES, 10K,1/8W,5%,CF		R	11	1.000	EA	R47	Yes		
370101-0272A	*1	85	RES, 2.7K,1/8W,5%,CF		R	22	1.000	EA	R59	Yes		
370101-0183A	*1	86	RES, 18K,1/8W,5%,CF		R	11	1.000	EA	R60	Yes		
401606-0000	*1	88	XFMR,DEFIB ISO BOARD SWIT CHING *CRITICAL*		R	22	1.000	EA	T1	Yes		
364000-0037A	*1	89	IC, F78L09		R	11	1.000	EA	U1	Yes		
364000-0194A	*1	90	IC, 4024B,CMOS BINARY DIV IDER		R	22	1.000	EA	U2	Yes		
364000-0193A	*1	91	IC, 34129,CURRENT MODE CO NTROLLER		R	22	1.000	EA	U3	Yes		
364000-0144A	*1	92	IC, LM393N,DUAL COMP		R	33	1.000	EA	U4	Yes		
364000-0010A	*1	93	IC, LM339		R	11	1.000	EA	U5	Yes		
364000-0192A	*1	94	IC, 4028B,BCD TO DECIMAL COUNTER		R	22	1.000	EA	U6	Yes		
364000-0132A	*1	95	IC, LF444 NATIONAL ONLY		R	22	1.000	EA	U7	Yes		
364000-0133A	*1	96	IC, TL062ACP		R	11	1.000	EA	U8	Yes		
364000-0059A	*1	97	IC, 555, TIMER CHIP, LINE AR		R	11	1.000	EA	U9	Yes		
364000-0111A	*1	98	IC, 78L15 +15V REG.		R	11	1.000	EA	U10	Yes		
364000-0191A	*1	99	IC, 79L15,-15V LOW POWER REGULATOR		R	22	1.000	EA	U11	Yes		
364000-0134A	*1	100	IC, ILD5 DUAL OPTO		R	11	2.000	EA	U12,13	Yes		
364000-0114A	*1	101	IC, TL064 ACN		R	11	1.000	EA	U14	Yes		

Medical Data Electronics
MANUFACTURING BOM WITH LABOR AND PROCESS

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401440-0000	PCBA, DEFIB ISOLATION REV. D (E1102)			A				D	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
374402-0502A	*1	102	POT, 5K,10-TURN,SIDE ADJ		R	22	1.000	EA	VR1	Yes		
384000-0155A	*1	103	CARD EJECTOR		R	22	2.000	EA	BE1,BE2	Yes		
370202-6982A	*1	104	RES, 69.8K,1/8W,1%,MF		R	22	3.000	EA	R64,65,66	Yes		
360600-0010A	*1	105	HTSNK, 5768B		R	11	1.000	EA	Q2	Yes		
370202-6041A	*1	107	RES, 6.04K,1/8W,1%,MF		R	22	3.000	EA	R49,50,36	Yes		
352300-0103A	*1	108	CAP, .01UF,50V,20%,RAD,MY LAR		R	22	1.000	EA	C20	Yes		
370202-1001A	*1	109	RES, 1.0K,1/8W,1%,MF		R	22	3.000	EA	R34,35,46	Yes		
352600-0038A	*1	110	CAP, 150pF,50V,1%,NPO,CER		R	22	2.000	EA	C56,57	Yes		
378000-0001A	*1	111	DIO, 1N270 T&R		R	11	1.000	EA	D11	Yes		
370101-0472A	*1	117	RES, 4.7K,1/8W,5%,CF		R	11	1.000	EA	R70	Yes		

DEFIBRILLATOR LOGIC BOARD

CHAPTER 6

6.0.0 DEFIBRILLATOR LOGIC BOARD

6.1.0 Power-Up Logic

The logic PCBA provides the intelligent circuitry which facilitates the gating and control functions for the defibrillator.

On power-up, a power reset signal is generated by Schmidt trigger U24D and gated by OR gate U3B. This power reset signal locks out the pacemaker function. Thus, preventing pulsing of the pacemaker during power up and providing a reset pulse for the defibrillator logic.

6.2.0 Defibrillator Charging Logic

Before the defibrillator can begin charging the storage capacitor, the following logic conditions must be met. System SHUTDOWN must be in the low state at pin 3 of NOR gate U1A. Pin 3 of U1A will only be high if the charge on the defibrillator storage capacitor is 4.75 KV or greater, thus preventing charging of the storage capacitor. Pin 4 of NOR gate U1A must be in the low state indicating the transfer relay is not momentarily discharging the storage capacitor. Pin 5 of U1A must be in the low state indicating the 60 second timeout disarm has not been reached. A second level of logic conditions must be met before the defibrillator can begin charging the storage capacitor. Pin 10 of NOR gate U1B must be in the low state indicating the transfer relay is in the correct position. Pin 11 of U1B must be low, indicating the dump relay is in the correct position. Pin 3 of U4A must be low, indicating external paddles are used or internal paddles are used with energy selected less than 50 joules.

If the charge key is pressed and there are no paddles attached, an alarm signal will be generated. The charge reset circuit will prevent latching of U6A and U6B. Pin 5 of one shot U15A will bring the 8 Hz alarm signal from U7 pin 1 through OR gate U16B to pulse Q3 and drive Alarm Buzzer BZ1 with an 8Hz alarm signal.

If the defibrillator is charged when internal paddles are used and an energy above 50 joules is selected, the charge reset circuit will prevent U6A and U6B from latching, thus prevent further charging of the defibrillator. Simultaneously, pin 5 of U10B will go low, returning the dump relay to a normally closed state, internally discharging the storage capacitor. NOR gate U11C pin 10 will be in a low state preventing FET Q5 from conducting, inhibiting defibrillator discharge.

When using internal paddles, discharging of energy is accomodated through the internal discharge key on the system front panel. If internal discharge key is pressed while using external paddles, an alarm sound will be generated via detection of U16C which in turn drives U13C pin 12 and alarm generator U15A.

6.3.0 Energy Select

Energy select C (high) and energy select D (low) indicate to the logic if the selected energy is greater than 50 joules or less than 50 joules, or if the energy select switch is between selected detents. When an energy level above 50 joules is selected, detector U14A will drive pin 8 of AND gate U10C low, conversely, when an energy level of 50 joules or less is selected, detector U14B will drive low pin 9 of AND gate U10C, simultaneous with driving low pin 3 of NOR gate U11B. If the energy select switch is between detents, both detectors U14A and U14B will be in the high state.

When an energy level of greater than 50 joules is selected and internal paddles are sensed. The output of U3A will be driven high which will prevent U6A and U6B from latching, thus preventing charging of the defibrillator. The output of U3C will be driven low if the charge key is pressed, thus driving U15A to trigger an alarm tone through U16B and U2B driving Q3 with the 8Hz alarm tone. Simultaneous with the previously mentioned conditions, pin 3 of NOR gate U11B will be driven low which will disable defibrillator discharge circuit through U11C and Q5, so the defibrillator cannot be discharged with an energy selected above 50 joules and internal paddles attached.

When an energy level greater than 50 joules is selected and standard paddles are sensed, the following logic events will take place. A low state will be sensed at pin 8 of U10C simultaneous with a low state sensed at pin 2 of OR gate U3A. A high state will be sensed at pin 1 of U3A indicating internal paddles are not connected, disabling ALARM 1 and staging a latch condition for U6A and U6B. When the charge key is pressed and all the above logic conditions are met, pin 11 of U16D will latch flip flop U6A and U6B. The output of this logic latch will start the charging circuit on the defibrillator power board through AND gate U10B. Simultaneous with this, the charge LED will be gated to flash with a 2Hz signal from U7 and gated through U12B and U12C. U16A will start the charge tone through U2B which drives Q3 with a 2Hz charging tone.

6.4.0 Charge Set

When the selected energy level is reached, a charge set signal will be generated on the power board. A CHARGE SET signal will latch U9B causing the charge LED to be in a steady ON condition and Q3 to drive buzzer BZ1 with a steady tone indicating the defibrillator is charged. When U9B is latched, the 60 second timer U7, U8, and U9B start counting. If the defibrillator storage capacitor is not discharged within 30 seconds, a momentary warning alarm (ALARM 3) will sound, indicating the defibrillator is still charged. If the defibrillator storage capacitor is not discharged after 60 seconds, pin 4 of U1A will go to a high state disabling the charge latch U6A and U6B, and driving U10B Pin 4 to a low state, returning the dump relay to the normally closed state and internally discharging the storage capacitor. U12C and U2B will return to their normal state where the charge LED is off and the buzzer BZ1 is off.

6.5.0 Charge High Condition

Charge high is a condition where the energy storage capacitor is charged to a level greater than the set energy selected. This condition is sensed on the defibrillator power board. When a charge high condition exists, AND gate U10B will be driven low, causing a momentary activation of the internal dump relay, bringing the stored energy down to the set level.

6.6.0 Defibrillator Discharge

When the defibrillator storage capacitor is charged and the above mentioned logic conditions are met, the defibrillator may be discharged. When the defibrillator discharge buttons are pressed on a standard paddle set, pin 6 of U17 will drive one shot U20A through U6C and U10A. This signal will drive Q4 to energize the transfer relay drive located on the defibrillator power board, thus discharging the defibrillator through the paddles. When the transfer relay energizes, latching conditions for U6A and U6B will be removed, thus turning off charge LED and buzzer BZ1.

6.7.0 Defibrillator Discharge With Internal Paddles

When internal defibrillator paddles are sensed and the above logic conditions are met with an energy level of 50 joules or less selected. The defibrillator may be charged as previously described. Once the defibrillator storage capacitor is

charged, the 60 second timer will start. When the internal paddle discharge key is pressed, FET Q5 will gate the discharge signal to pin 10 of U17 and thus the defibrillator will be discharged through the internal paddles.

6.8.0 Sync Mode

When the sync mode key is pressed, the inverting Schmidt Trigger U5E will pulse clock pin 3 of U19A, which will latch up U19A with pin 1 in a high state bringing pin 12 of AND gate U4D high. Pin 9 of U20B will pulse low in sync with the R wave flag signal which will pulse low pin 13 of U4D in SYNC with the R wave. With the above described logic conditions met and the defibrillator storage capacitor is charged, and the defibrillator discharge key is pressed, U17 pin 6 will drive low pin 9 of U6C. With both inputs low on NOR gate, U6C Pin 10 will be driven high. When an R wave flag is detected, Pin 13 of AND gate U4D will be driven low, thus driving pin 2 of AND gate U10A high triggering the transfer relay drive pulse through U20A. Simultaneous with the control pulse for the transfer relay, a transfer relay disarm signal will drive Pin 4 of NOR gate U1A high driving pin 4 of U19A low, thus turning the sync circuit off.

6.9.0 Disarm

When the defibrillator has been fully charged for a period of less than 60 seconds, an unneeded charge may be internally dumped when the disarm key is pressed. Pin 2 of U17 will drive pin 2 of U2A to a low state which drives pin 3 of U6A low which drives AND gate U10B low and allows the dump relay to return to a normally closed state and discharges the storage capacitor through an internal dump load.

6.10.0 ECG Select

The defibrillator will always power up with the ECG select in the leads mode. U19B will latch with pin 13 low and pin 12 high. This will latch U22A off, blocking paddles ECG and U22B will be latched ON enabling ECG from the E300A monitor. When the ECG select key is pressed, U17 pin 13 will go low and momentarily bring high Schmidt Trigger Pin 2, U24A, toggling switches U22A ON and U22B OFF enabling paddles ECG and disabling leads ECG.

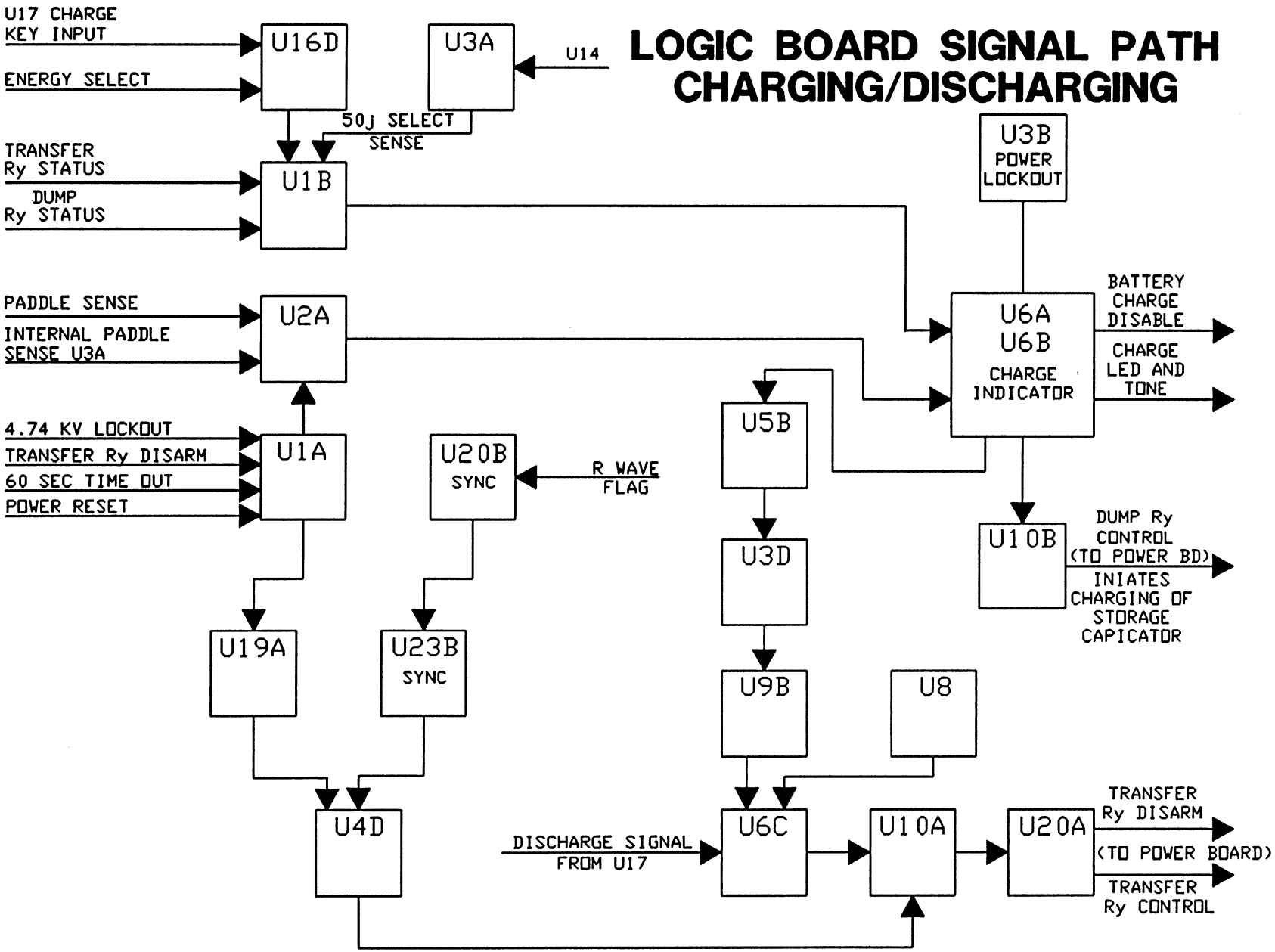
6.11.0 Front Panel Keys and Tone

When any of the keys on the front panel are pressed, key debouncer U17 will drive low an input of NAND gate U18 which will pulse high pin 12 of one shot U15B. This pulse will momentarily drive transistor Q3, thus causing buzzer BZ1 to beep.

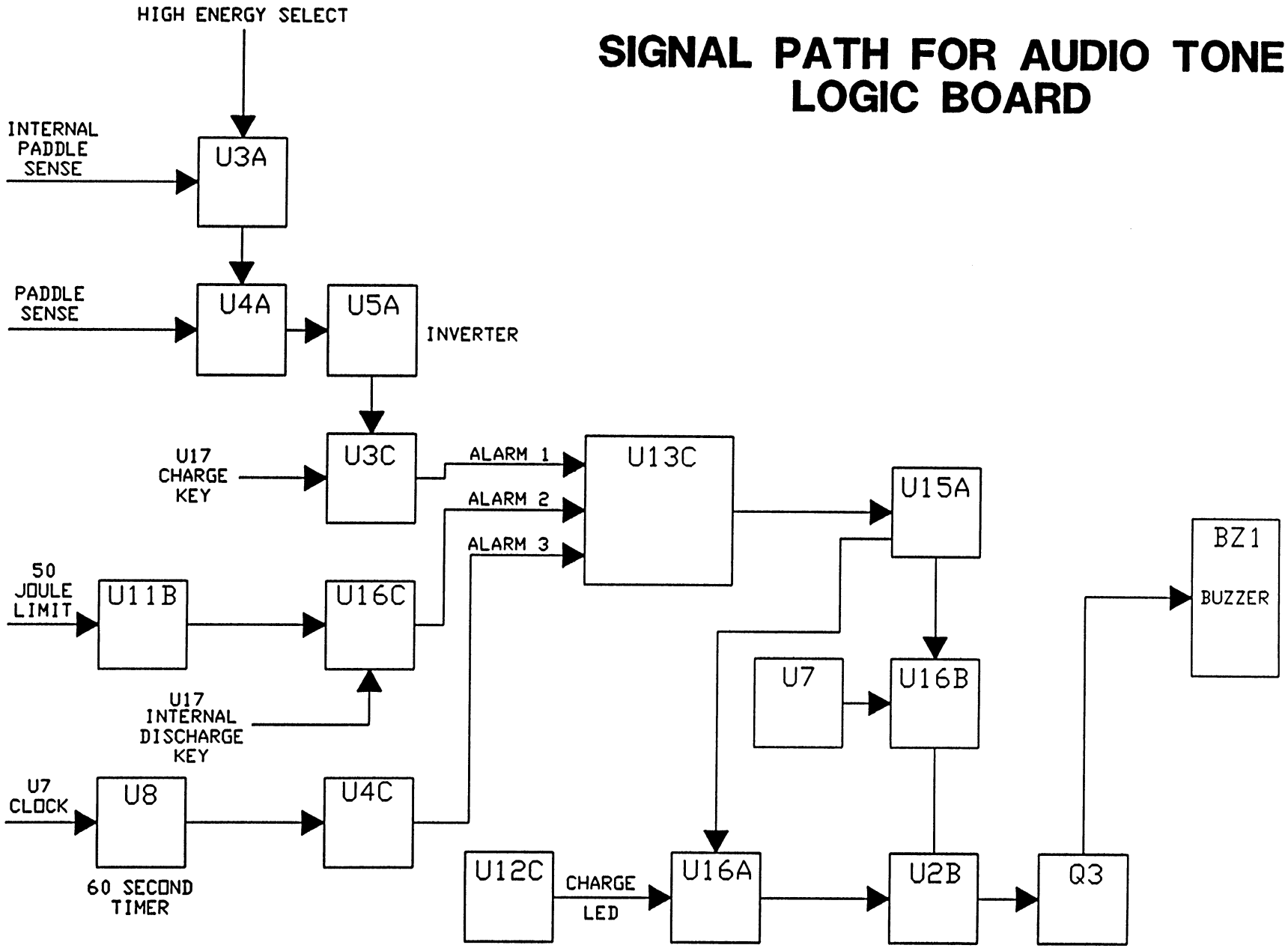
6.12.0 R-Wave Detector Circuit

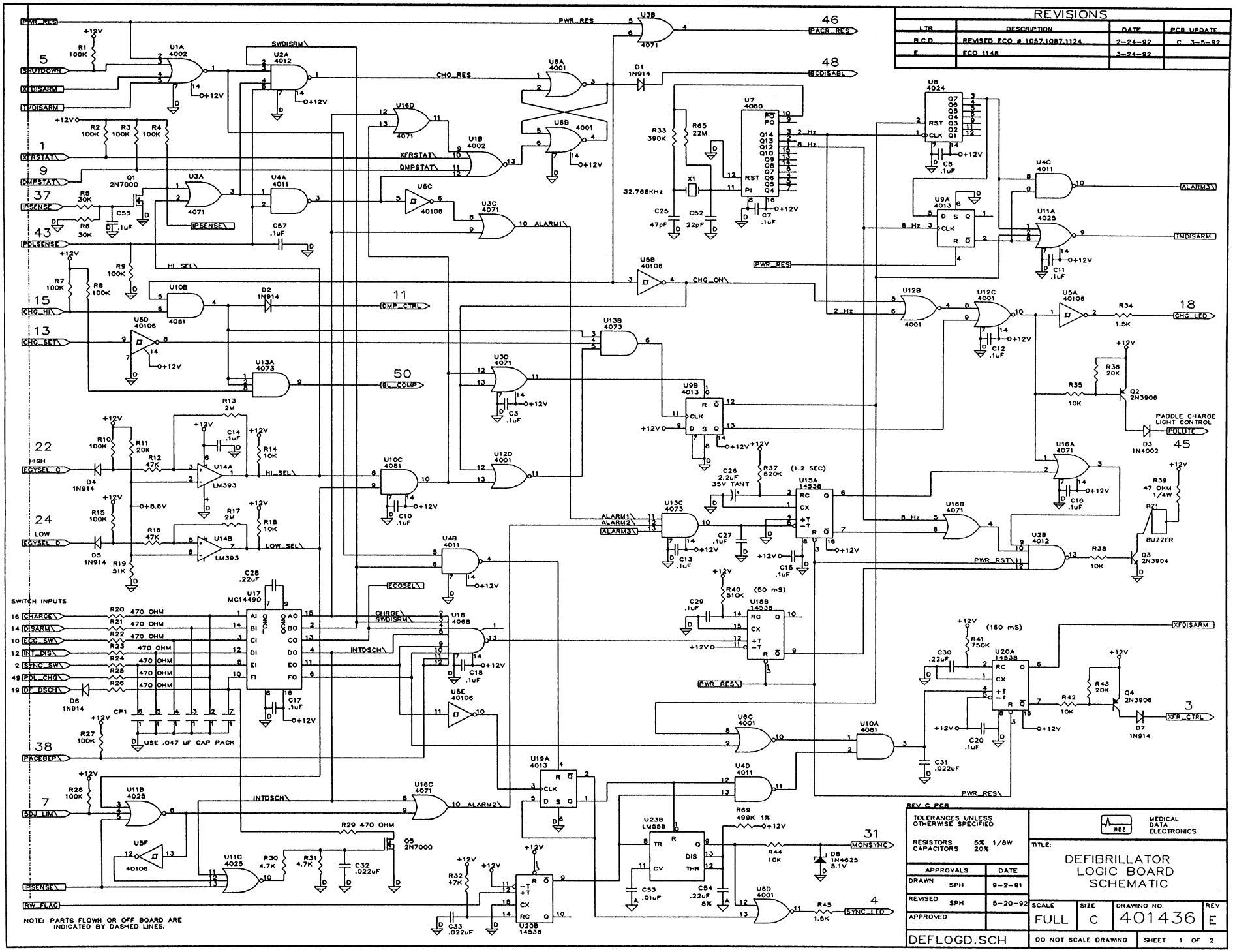
I.C. U21C provides a second order band pass filter, center frequency at 13 Hz. U21A regenerates an inverse signal of U21C output. Both inverse and noninverse output signals are fed into voltage doubler circuits comprised of C43, D11, D12, C56, D14, D15 and C44 and sum together at U21D Pin 12. U21D compares incoming signal with predetermined voltage threshold, and drives a one shot U23A, which generates R-wave flag with refractory period of 240 msec. The R-wave flag signal is used for defibrillator cardioversion (SYNC) and also used in external pacer board (option).

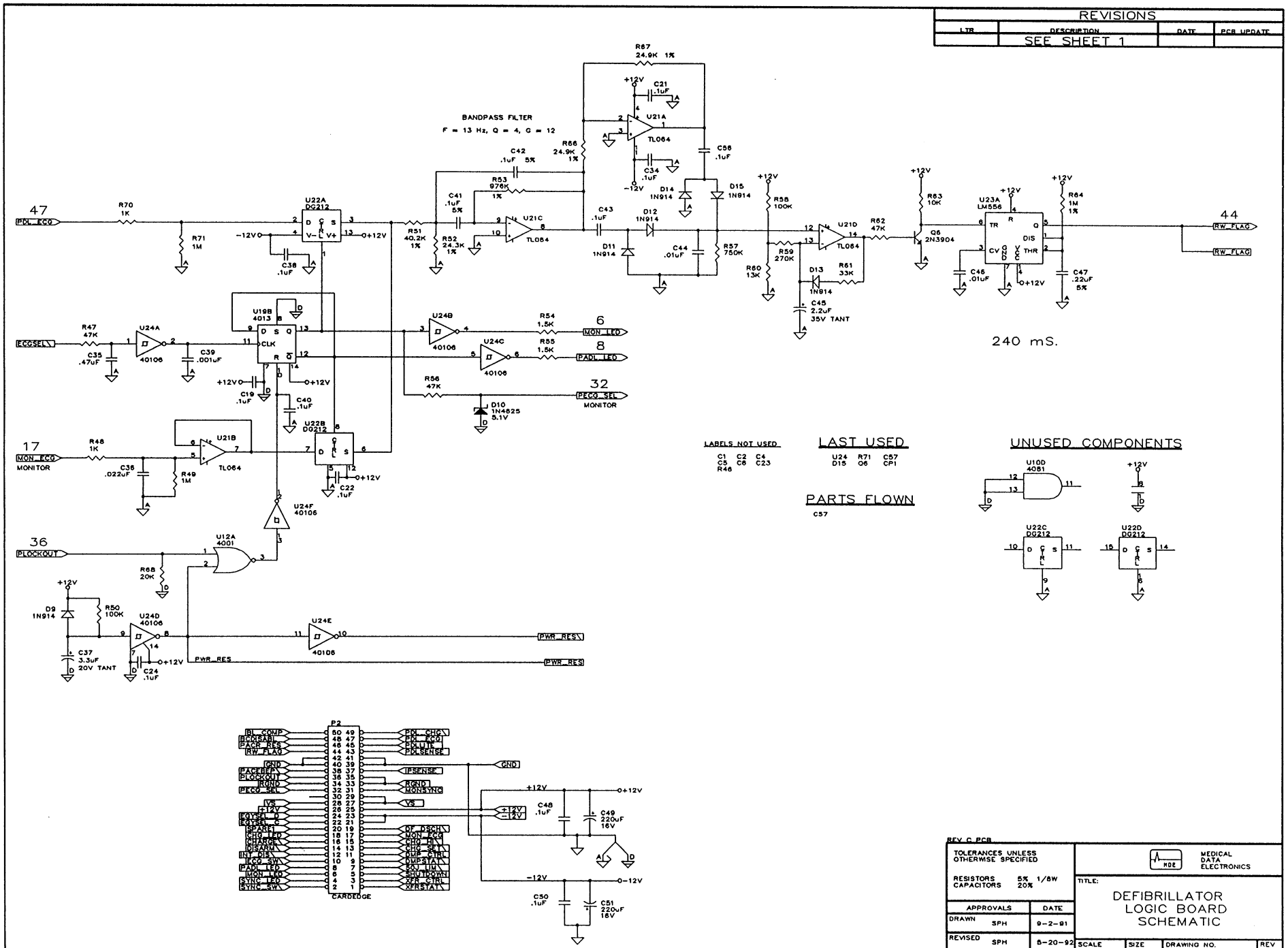
LOGIC BOARD SIGNAL PATH CHARGING/DISCHARGING

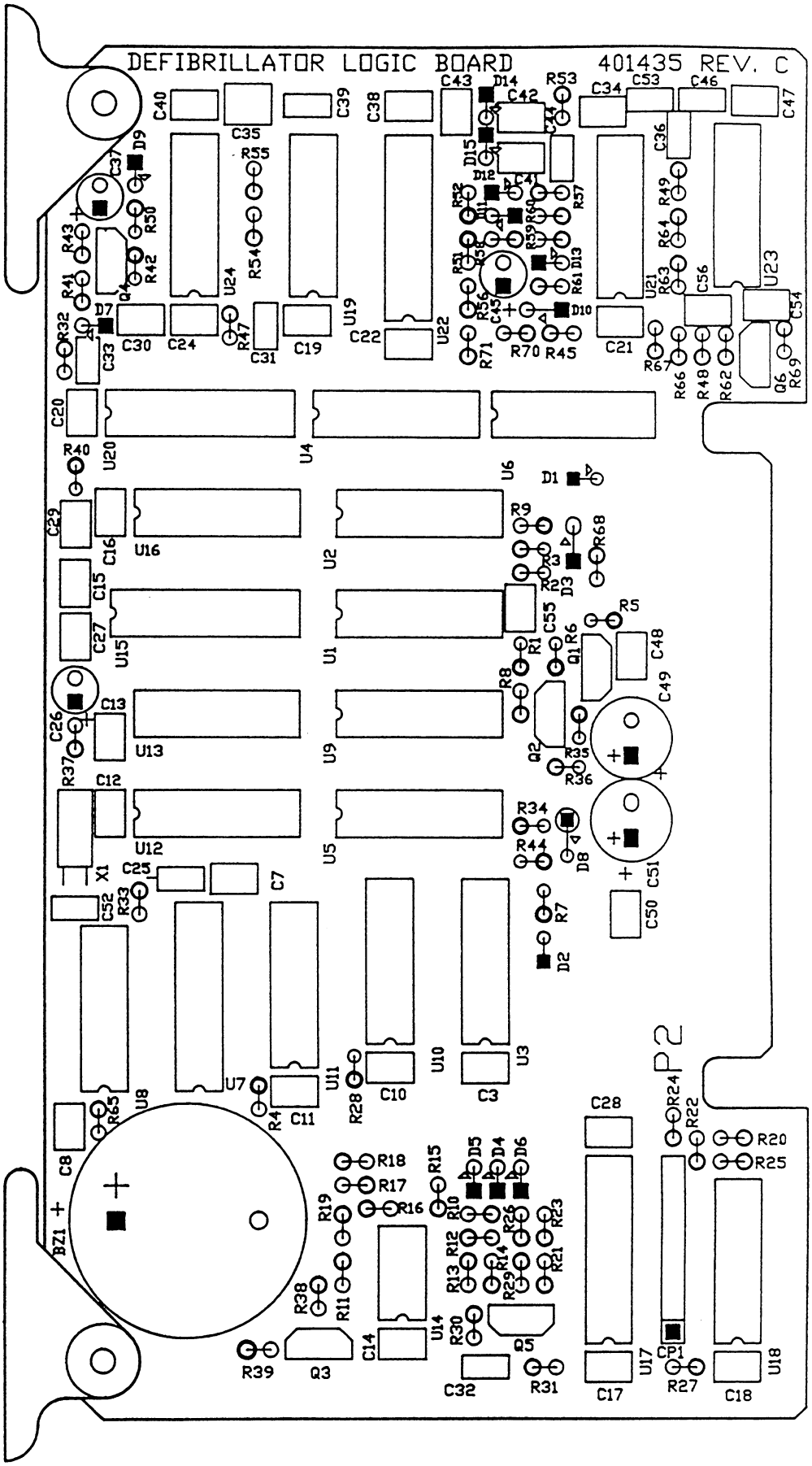


SIGNAL PATH FOR AUDIO TONE LOGIC BOARD




REVISIONS
LTR | DESCRIPTION | DATE | PCB UPDATE
B,C,D | REVISED ECO # 1087,1087,1124 | 2-24-92 | C 3-5-92
F | ECO 1148 | 3-24-92 |
REV C PCB
TOLERANCES UNLESS OTHERWISE SPECIFIED
RESISTORS 5% 1/8W
CAPACITORS 20%
APPROVALS | DATE
DRAWN SPH 9-2-91
REVISED SPH 5-20-92
APPROVED
MEDICAL DATA ELECTRONICS
TITLE:
DEFIBRILLATOR LOGIC BOARD SCHEMATIC
SCALE FULL | SIZE C | DRAWING NO. 401436 | REV E
DEFLOGD.SCH
DO NOT SCALE DRAWING | SHEET 1 OF 2
NOTE: PARTS FLOWN OR OFF BOARD ARE INDICATED BY DASHED LINES.
SWITCH INPUTS
PWR_RES
SHUTDOWN
XFDISARM
TMDISARM
XFRSTAT
DMPSTAT
IPSENSE
PDLSENSE
CHG_HI
CHG_SEL
HIGH
ECGSEL_C
LOW
ECGSEL_D
PACEBEP
SOJ_LIM
RW_FLAG
CHARGE
DISARM
ECG_SW
INT_DIS
SYNC_SW
PDL_CHG
DF_DSCH
SWDISRM
CHG_RES
HI_SEL
LOW_SEL
DMP_CTRL
BL_COMP
ECGSEL
CHRGE
INTDSCH
ALARM1
ALARM2
ALARM3
PWR_RST
PACR_RES
BCDISABL
CHG_ON
2_Hz
8_Hz
ALARM3
TMDISARM
CHG_LED
PADDLE CHARGE LIGHT CONTROL
POLLITE
XFDISARM
XFR_CTRL
MONSYNC
SYNC_LED
(1.2 SEC)
(50 mS)
(150 mS)
USE .047 uF CAP PACK
32.768KHz
LM393
MC14490
LM555
2N7000
2N3906
2N3904
1N914
1N4625 5.1V
BUZZER
8-9


REVISIONS
LTR
DESCRIPTION
DATE
PCB UPDATE
SEE SHEET 1
BANDPASS FILTER
F = 13 Hz, Q = 4, G = 12
240 mS.
LABELS NOT USED
C1 C2 C4
C5 C6 C23
R46
LAST USED
U24 R71 C57
D15 Q6 CP1
PARTS FLOWN
C57
UNUSED COMPONENTS
NOTE: PARTS FLOWN OR OFF BOARD ARE INDICATED BY DASHED LINES.
REV C PCB
TOLERANCES UNLESS OTHERWISE SPECIFIED
RESISTORS 5% 1/8W
CAPACITORS 20%
APPROVALS
DRAWN SPH 9-2-91
REVISED SPH 5-20-92
APPROVED
MEDICAL DATA ELECTRONICS
TITLE:
DEFIBRILLATOR LOGIC BOARD SCHEMATIC
SCALE FULL
SIZE C
DRAWING NO. 401436
REV E
DEFLOGD.SCH
DO NOT SCALE DRAWING
SHEET 2 OF 2


DEFIBRILLATOR LOGIC BOARD
401435 REV. C
P2

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
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Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401435-0000	*1	1	PCB, DEFIB LOGIC REV. C (E1138) - UL/CERTS REQ	C	R	33	1.000	EA	-	Yes		
362000-0022A	*1	2	BUZZER, PIEZO ELECT		R	22	1.000	EA	BZ1	Yes		
352600-0034A	*1	3	CAP, .047uF,NETWORK,7-PIN ,6-COMPOMEMT,COMMON LEAD		R	22	1.000	EA	CP1	Yes		
352300-0104A	*1	4	CAP, .1UF,50V,20%,RAD,MYL AR		R	22	8.000	EA	C3,7,8,10,11,12,13,14	Yes		
352300-0104A	*1	5	CAP, .1UF,50V,20%,RAD,MYL AR		R	22	7.000	EA	C15,16,17,18,19,20,21	Yes		
352300-0104A	*1	6	CAP, .1UF,50V,20%,RAD,MYL AR		R	22	6.000	EA	C22,24,27,29,34,38	Yes		
352300-0104A	*1	7	CAP, .1UF,50V,20%,RAD,MYL AR		R	22	6.000	EA	C40,43,48,50,55,57	Yes		
352101-0470A	*1	8	CAP, 47pF,50V,10%,NPO,CER ,RAD		R	22	1.000	EA	C25	Yes		
352401-0225A	*1	9	CAP, 2.2UF,35V,20%,TANT		R	11	2.000	EA	C26,45	Yes		
352300-0016A	*1	10	CAP, .22UF,5%,MYLAR		R	77	4.000	EA	C28,30,47,54	Yes		
352300-0223A	*1	11	CAP, .022UF,50V,20%,MYLAR		R	22	4.000	EA	C31,32,33,36	Yes		
352300-0474A	*1	12	CAP, .47UF, 50V,20%,RAD,M YLAR(METALLIZED POLYESTR)		R	22	1.000	EA	C35	Yes		
352400-0335A	*1	13	CAP, 3.3UF,20V,20%,RAD,TA NT		R	11	1.000	EA	C37	Yes		
352300-0102A	*1	14	CAP, 1000PF,50V,20%,RAD,M YLAR		R	66	1.000	EA	C39	Yes		
352301-0104A	*1	15	CAP, .1UF,5%,MYLAR		R	66	2.000	EA	C41,42	Yes		
352300-0103A	*1	16	CAP, .01UF,50V,20%,RAD,MY LAR		R	22	3.000	EA	C44,46,53	Yes		
352203-0227A	*1	17	CAP, 220uF,16V,20%.RAD,EL ECT,8mm x 12mm		R	77	2.000	EA	C49,51	Yes		
378000-0005A	*1	18	DIO, 1N914,SIGNAL T&R		R	11	12.000	EA	D1,2,4-7,9,11-15	Yes		
378000-0002A	*1	19	DIO, 1N4002GP,RCTFR, (MOT ONLY) T&R		R	11	1.000	EA	D3	Yes		
378000-0026A	*1	20	DIO, 1N4625 (OR 1N4689)		R	11	2.000	EA	D8,10	Yes		
376000-0019A	*1	21	XSTR, 2N7000,FET		R	11	2.000	EA	Q1,5	Yes		
376000-0011A	*1	22	XSTR, 2N3906,SIGNAL		R	11	2.000	EA	Q2,4	Yes		
376000-0003A	*1	23	XSTR, 2N3904		R	11	2.000	EA	Q3,6	Yes		
370101-0104A	*1	24	RES, 100K,1/8W,5%,CF		R	11	12.000	EA	R1-4,7-10,15,27,28,50	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
401436-0000	PCBA, DEFIB LOGIC REV. E (E1148)			A			E	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370101-0104A	*1	25	RES, 100K,1/8W,5%,CF		R	11	1.000	EA	R58	Yes		
370101-0473A	*1	26	RES, 47K,1/8W,5%,CF		R	11	6.000	EA	R12,16,32,47,56,62	Yes		
370101-0303A	*1	27	RES, 30K,1/8W,5%,CF		R	11	2.000	EA	R5,6	Yes		
370101-0203A	*1	28	RES, 20K,1/8W,5%,CF		R	11	4.000	EA	R11,36,43,68	Yes		
370101-0205A	*1	29	RES, 2M,1/8W,5%,CF		R	11	2.000	EA	R13,17	Yes		
370101-0103A	*1	30	RES, 10K,1/8W,5%,CF		R	11	7.000	EA	R14,18,35,38,42,44,63	Yes		
370101-0513A	*1	31	RES, 51K,1/8W,5%,CF		R	11	1.000	EA	R19	Yes		
370101-0471A	*1	32	RES, 470,1/8W,5%,CF		R	11	8.000	EA	R20-26,29	Yes		
370101-0472A	*1	33	RES, 4.7K,1/8W,5%,CF		R	11	2.000	EA	R30,31	Yes		
370101-0394A	*1	34	RES, 390K,1/8W,5%,CF		R	11	1.000	EA	R33	Yes		
370101-0152A	*1	35	RES, 1.5K,1/8W,5%,CF		R	22	4.000	EA	R34,45,54,55	Yes		
370101-0624A	*1	36	RES, 620K,1/8W,5%,CF		R	11	1.000	EA	R37	Yes		
370100-0470A	*1	37	RES, 47,1/4W,5%,CF		R	11	1.000	EA	R39	Yes		
370101-0514A	*1	38	RES, 510K,1/8W,5%,CF		R	11	1.000	EA	R40	Yes		
370101-0754A	*1	39	RES, 750K,1/8W,5%,CF		R	22	2.000	EA	R41,57	Yes		
370101-0105A	*1	40	RES, 1M,1/8W,5%,CF		R	11	2.000	EA	R49,71	Yes		
370101-0102A	*1	41	RES, 1K,1/8W,5%,CF		R	11	2.000	EA	R48,70	Yes		
370202-4122A	*1	42	RES, 41.2K,1/8W,1%,MF		R	22	1.000	EA	R51	Yes		
370202-2432A	*1	43	RES, 24.3K,1/8W,1%,MF		R	22	1.000	EA	R52	Yes		
370202-9763A	*1	44	RES, 976K,1/8W,1%,MF		R	22	1.000	EA	R53	Yes		
370101-0274A	*1	45	RES, 270K,1/8W,5%,CF		R	11	1.000	EA	R59	Yes		
370101-0133A	*1	46	RES, 13K,1/8W,5%,CF		R	11	1.000	EA	R60	Yes		
370101-0333A	*1	47	RES, 33K,1/8W,5%,CF		R	22	1.000	EA	R61	Yes		
364000-0187A	*1	48	IC, 4002B,DIGITAL,DUAL 4-INPUT NOR GATES		R	22	1.000	EA	U1	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401436-0000	PCBA, DEFIB LOGIC REV. E (E1148)			A				E	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
364000-0186A	*1	49	IC, 4012B,DIGITAL,DUAL 4-INPUT NAND GATES		R	22	1.000	EA	U2	Yes		
364000-0185A	*1	50	IC, 4071B,DIGITAL,QUAD 2-INPUT OR GATES		R	22	2.000	EA	U3,U16	Yes		
364000-0184A	*1	51	IC, 4011B,DIGITAL,QUAD DUAL INPUT NAND GATES		R	22	1.000	EA	U4	Yes		
364000-0183A	*1	52	IC, 40106B,DIGITAL,CMOS,HEX SCHMITT TRIGGERS		R	22	2.000	EA	U5,24	Yes		
364000-0189A	*1	53	IC, MC14001B OR 4001B,QUAD 2-INPUT NOR GATE		R	22	2.000	EA	U6,12	Yes		
364000-0182A	*1	54	IC, 4060B,DIGITAL,BINARY COUNTER DIVIDER OSCILLATR		R	22	1.000	EA	U7	Yes		
364000-0194A	*1	55	IC, 4024B,CMOS BINARY DIVIDER		R	22	1.000	EA	U8	Yes		
364000-0188A	*1	56	IC, MC14013B OR 4013B,DIGITAL,DUAL TYPE D FLIPFLOP		R	22	2.000	EA	U9,19	Yes		
364000-0181A	*1	57	IC, 4081B,DIGITAL,CMOS QUAD DUAL INPUT & GATES		R	22	1.000	EA	U10	Yes		
364000-0180A	*1	58	IC, 4025B,DIGITAL,CMOS TRIPPLE 3-INPUT NOR GATE		R	22	1.000	EA	U11	Yes		
364000-0179A	*1	59	IC, 4073B,DIGITAL,CMOS,TRIPPLE 3-INPUT & GATES		R	22	1.000	EA	U13	Yes		
364000-0144A	*1	60	IC, LM393N,DUAL COMP		R	33	1.000	EA	U14	Yes		
364000-0177A	*1	61	IC, 14538B,DIGITAL,CMOS DUAL MONOSTBL,MULTIVIBRATR		R	22	2.000	EA	U15,20	Yes		
364000-0190A	*1	62	IC, 14490,CONTACT BOUNCE ELIMINATOR		R	22	1.000	EA	U17	Yes		
364000-0178A	*1	63	IC, 4068B,DIGITAL,CMOS 8-INPUT AND/NAND GATE		R	22	1.000	EA	U18	Yes		
364000-0114A	*1	64	IC, TL064 ACN		R	11	1.000	EA	U21	Yes		
364000-0008A	*1	65	IC, DG212CJ		R	11	1.000	EA	U22	Yes		
364000-0196A	*1	66	IC, LM556		R	22	1.000	EA	U23	Yes		
356000-0010A	*1	67	XTAL, 32.768 KHZ		R	11	1.000	EA	X1	Yes		
384000-0155A	*1	68	CARD EJECTOR		R	22	2.000	EA	BE1,BE2	Yes		
370202-1004A	*1	69	RES, 1.0M,1/8W,1%,MF		R	22	1.000	EA	R64	Yes		
352101-0220A	*1	70	CAP, 22pF,50V,10%,NPO,CER,RAD		R	22	1.000	EA	C52	Yes		
370101-0226A	*1	72	RES, 22M,1/8W,5%,CF		R	22	1.000	EA	R65	Yes		
370202-2492A	*1	73	RES, 24.9K,1/8W,1%		R	11	2.000	EA	R66,67	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401436-0000	PCBA, DEFIB LOGIC REV. E (E1148)			A				E	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370202-4993A	*1	74	RES, 499K,1/8W,1%		R	11	1.000	EA	R69	Yes		
352100-0104A	*1	75	CAP, .1UF,50V,10%,RAD,X7R		R	11	1.000	EA	C56	Yes		

PACER PCBA

CHAPTER 7

7.0.0 PACER BOARD

7.1.0 Power-Up and Basic Operation

The pacer is turned on by pressing the pacer start/stop key. (When the start key is pressed, Pin 2 of U5 will change the state of U6B, triggering U7B.) Pin 13 of U7B will initiate paddle ECG lockout and power the START LED. Flip-flop U7A will be latched in the demand mode at power up, driving the pacer demand LED. With U7A latched in the demand mode, switch U1B, will be in the closed state switching the R wave flag to the base of Q6. Pin 12 of U7B will open U1C which allows C28 to charge.

Charging C28 above 8V will start timer U8. The pulse rate for the pacer is set by changing the resistance at pin 7 of U8, which will increase or decrease the time it takes for C28 to charge to 8V. When C28 charges to 8V, pin 3 of U8 will drive U6D to change logic states sending a PACE ON flag to E300A monitor and start 22 ms timer U9. The 22 ms timer generates the pace pulse 22 ms wide. The output of U9 through Q7 will open switch U1A for 22 ms. Timer U9 also triggers a 300 ms refractory timer U10.

7.2.0 Demand Mode Operation

In the demand mode, if the detected heart rate is greater than the pacer set rate, the R wave flag will drive Q6 to conduct, discharging C28. This prevents the trigger of timer U8. When the detected heart rate is less than the pacer set rate, Q6 will be shut off, allowing C28 to charge to 8V triggering timer U8. When U9 pulses timer U10 will delay this signal by 300 ms to the base of Q5, preventing Q6 from turning on, allowing C28 to charge for 300 ms to block artifact.

7.3.0 Asynchronous Mode

When Async mode is selected, U7A will change state, latching Pin 3 high which will turn on Async mode LED. Pin 2 will be low, turning off Demand Mode LED and turning off switch U1B. With switch U1B off the R wave flag signal will be blocked from the base of transistor Q6 and capacitor C28 will charge at the pacer set rate. When U9 pulses timer U10 will turn on Q5 for 300 ms, turning off Q6, allowing capacitor C28 to charge. Timer U9 through transistor Q7 generates the 22 ms signal to turn on the pacer output.

7.4.0 Pacer Output

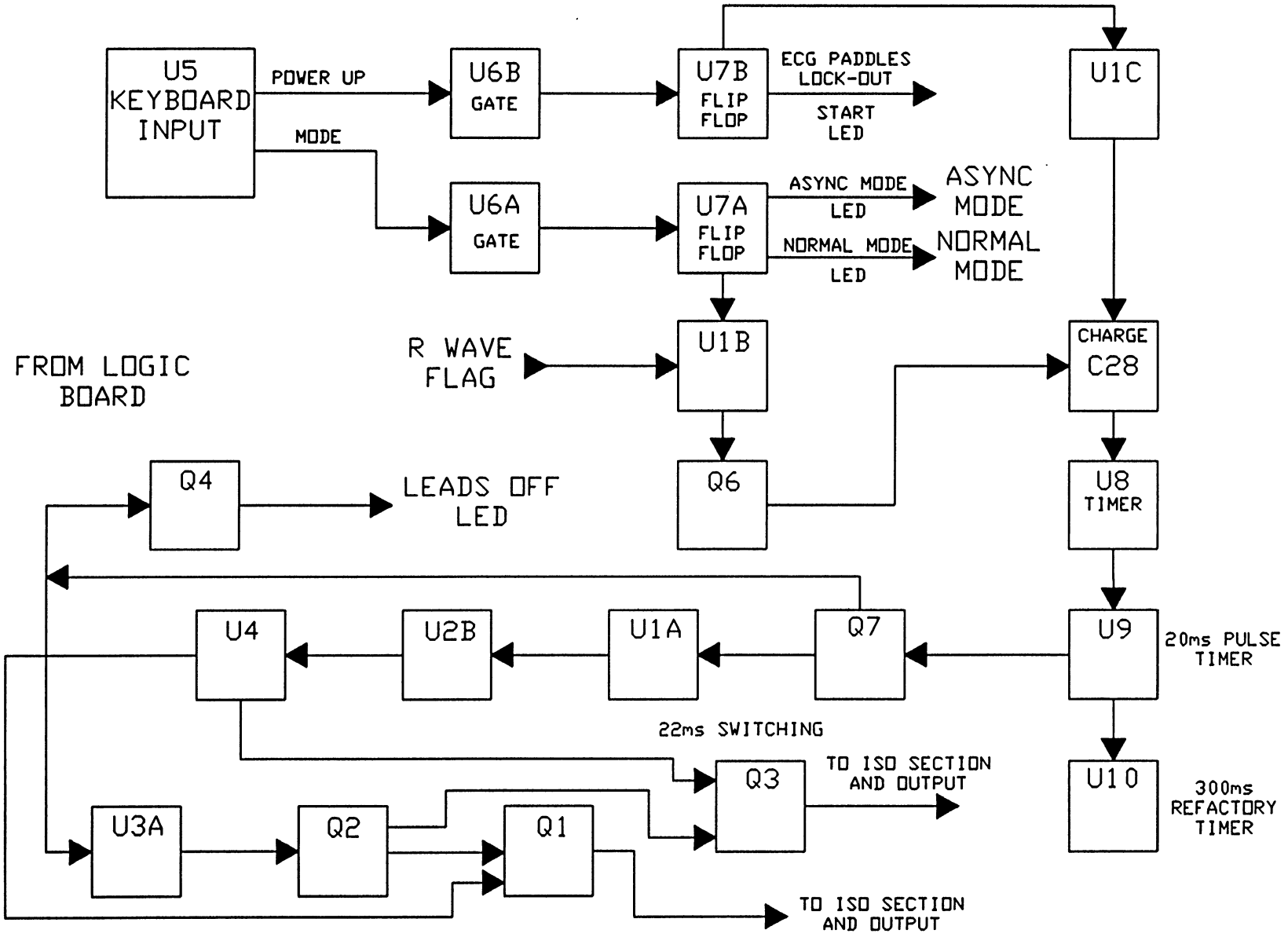
When switch U1A is closed, C11 will charge to a voltage proportional to the pacer set current. The pacer drive signal will drive open switch U1A for 22 ms. When switch U1A opens, C11 will discharge through buffer U2B. The truncated output waveform is shaped by C11 and R4 as C11 discharges into the collectors (pins 12 and 13) of the pulse width modulator through buffers U2 and U4. Pins 11 and 14 of U4 drive Darlington transistors Q1 and Q3 to output through transformer T1 into bridge rectifier BR1. Darlington transistors Q1 and Q3 are powered by turning on Darlington transistor Q2 when comparitor U3A pin 1 is low during the 22 ms period generated by U9 and Q7, protection circuit.

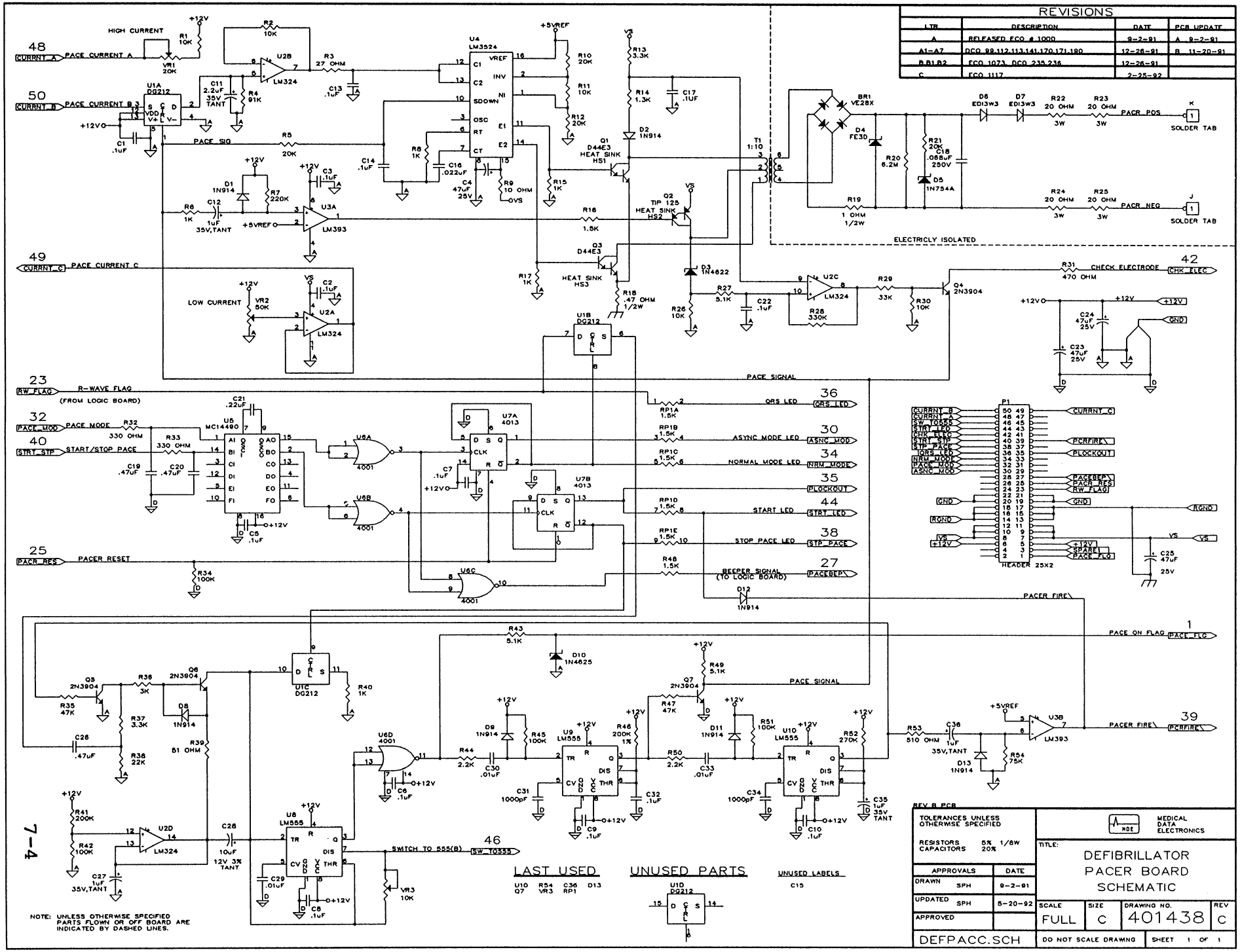
Defibrillator protection is provided by D6, D7, R22, R23, R24 and R25.

7.5.0 Indicators

The check electrodes signal is generated by Q2 and U2C. The voltage drop across the T1 windings connected to Q2 is proportional to the resistance across the pace electrodes. This signal is compared to reference diode D3. If the pulse voltage is greater than D3, comparitor U2C will turn on Q4 and drive the check leads LED.

BLOCK DIAGRAM PACER BOARD




REVISIONS
LTR | DESCRIPTION | DATE | PCB UPDATE
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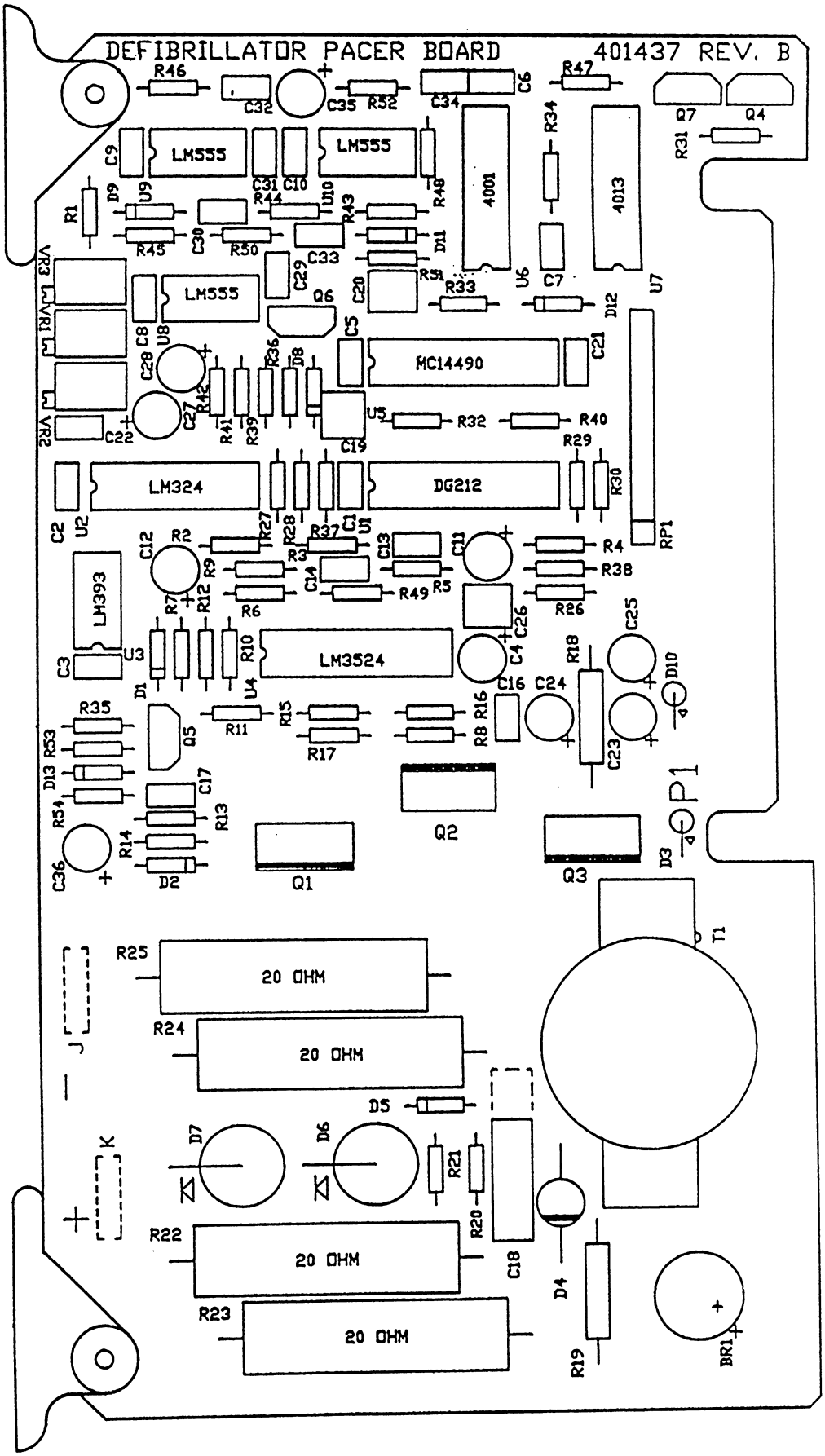
A1-A7 | DCO 88,112,113,141,170,171,180 | 12-26-91 | B 11-20-91
B,B1,B2 | ECO 1073, DCO 235,236 | 12-26-91 |
C | ECO 1117 | 2-25-92 |
HIGH CURRENT
LOW CURRENT
48 CURRNT_A PACE CURRENT A
50 CURRNT_B PACE CURRENT B
49 CURRNT_C PACE CURRENT C
PACE SIG
ELECTRICLY ISOLATED
BR1 VE28X
D4 FE3D
D5 1N754A
D6 EDI3W3
D7 EDI3W3
PACR POS
PACR NEG
SOLDER TAB
HEAT SINK HS1
HEAT SINK HS2
HEAT SINK HS3
T1 1:10
CHECK ELECTRODE
42 CHK_ELEC
23 RW_FLAG R-WAVE FLAG (FROM LOGIC BOARD)
32 PACE_MOD PACE MODE
40 STRT_STP START/STOP PACE
25 PACR_RES PACER RESET
PACE SIGNAL
QRS LED
ASYNC MODE LED
NORMAL MODE LED
PCLOCKOUT
START LED
STOP PACE LED
BEEPER SIGNAL (TO LOGIC BOARD)
PACER FIRE
PACE ON FLAG
HEADER 25X2
SWITCH TO 555(B)
SW_TO555
LAST USED
U10 Q7 R54 VR3 C36 RP1 D13
UNUSED PARTS
UNUSED LABELS
C15
NOTE: UNLESS OTHERWISE SPECIFIED PARTS FLOWN OR OFF BOARD ARE INDICATED BY DASHED LINES.
REV B PCB
TOLERANCES UNLESS OTHERWISE SPECIFIED
RESISTORS 5% 1/8W
CAPACITORS 20%
APPROVALS | DATE
DRAWN SPH 9-2-91
UPDATED SPH 5-20-92
APPROVED
MEDICAL DATA ELECTRONICS
TITLE: DEFIBRILLATOR PACER BOARD SCHEMATIC
SCALE FULL | SIZE C | DRAWING NO. 401438 | REV C
DEFPACC.SCH
DO NOT SCALE DRAWING | SHEET 1 OF 1
7-4


DEFIBRILLATOR PACER BOARD
401437 REV. B
LM555
LM555
LM555
4001
4013
MC14490
LM324
DG212
LM393
LM3524
20 OHM
20 OHM
20 OHM
P1
J
K

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401438-0000	PCBA, DEFIB PACER REV. C (E1117)			A				C	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401437-0000	*1	1	PCB, DEFIB PACER REV. B (E1050) - UL/CERTS REQ	B	R	33	1.000	EA	-	Yes		
360600-0060A	*1	2	TAB, SOLDER .205 X .032 I N THICK		R	22	2.000	EA	J,K	Yes		
378000-0024A	*1	3	DIO, VE48X,200V MIN,FAST RECOVERY,BRIDGE		R	22	1.000	EA	BR1	Yes		
352300-0104A	*1	4	CAP, .1UF,50V,20%,RAD,MYL AR		R	22	9.000	EA	C1,2,3,5,6,7,8,9,10	Yes		
352300-0104A	*1	5	CAP, .1UF,50V,20%,RAD,MYL AR		R	22	4.000	EA	C13,14,17,22	Yes		
352200-0476A	*1	6	CAP, 47UF,25V,RAD,ELECT		R	55	4.000	EA	C4,23,24,25	Yes		
352401-0225A	*1	7	CAP, 2.2UF,35V,20%,TANT		R	11	1.000	EA	C11	Yes		
352400-0105A	*1	8	CAP, 1UF,50V,20%,RAD,TANT , MAX: HT. .28; O.D. .16		R	11	4.000	EA	C12,27,35,36	Yes		
352300-0102A	*1	9	CAP, 1000PF,50V,20%,RAD,M YLAR		R	66	2.000	EA	C31,34	Yes		
352300-0223A	*1	10	CAP, .022UF,50V,20%,MYLAR		R	22	1.000	EA	C16	Yes		
352600-0035A	*1	11	CAP, .068uF,250V,20%,META LLIZED POLYESTR,WIMA MKS4		R	22	1.000	EA	C18	Yes		
352300-0474A	*1	12	CAP, .47UF, 50V,20%,RAD,M YLAR(METALLIZED POLYESTR)		R	22	2.000	EA	C19,20	Yes		
352300-0224A	*1	13	CAP, .22UF,50V,20%,MYLAR		R	22	1.000	EA	C21	Yes		
352300-0103A	*1	14	CAP, .01UF,50V,20%,RAD,MY LAR		R	22	3.000	EA	C29,30,33	Yes		
352402-0106A	*1	15	CAP, 10uF,3%,12V(OR HIGHE R),TANT -SORT 352400-0106		R	11	1.000	EA	C28	Yes		
378000-0005A	*1	16	DIO, 1N914,SIGNAL T&R		R	11	7.000	EA	D1,2,8,9,11,12,13	Yes		
378000-0020A	*1	17	DIO, 1N4622,3.9V,10%,ZENE R		R	11	1.000	EA	D3	Yes		
378000-0031A	*1	18	DIO, FE3D,200V,3A,ULTRAFA ST-2ND OP PREP INTERFAB		R	11	1.000	EA	D4	Yes		
378000-0009A	*1	19	DIO, 1N754A,6.8V,ZENER T& R ***MOT ONLY***		R	11	1.000	EA	D5	Yes		
378000-0056A	*1	20	DIO, EDI3W3,3A,3000V,300 AMP SURGE		R	22	2.000	EA	D6,7	Yes		
378000-0026A	*1	21	DIO, 1N4625 (OR 1N4689)		R	11	1.000	EA	D10	Yes		
376000-0028A	*1	22	XSTR, D44E3,10-AMP,N-P-N DARLINGTON,PWR		R	22	2.000	EA	Q1,3	Yes		
376000-0010A	*1	23	XSTR, TIP 125,DARLINGTON PWR XSTR		R	11	1.000	EA	Q2	Yes		
376000-0003A	*1	25	XSTR, 2N3904		R	11	4.000	EA	Q4,5,6,7	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401438-0000	PCBA, DEFIB PACER REV. C (E1117)			A				C	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370300-0012A	*1	26	RES, SIP,1.5K,5%,ISOLATED ,10-PIN,5-COMP,NETWRK		R	22	1.000	EA	RP1	Yes		
370101-0103A	*1	27	RES, 10K,1/8W,5%,CF		R	11	4.000	EA	R2,11,26,30	Yes		
370101-0270A	*1	28	RES, 27,1/8W,5%,CF		R	11	1.000	EA	R3	Yes		
370101-0913A	*1	29	RES, 91K,1/8W,5%,CF		R	22	1.000	EA	R4	Yes		
370101-0473A	*1	30	RES, 47K,1/8W,5%,CF		R	11	2.000	EA	R35,47	Yes		
370101-0102A	*1	31	RES, 1K,1/8W,5%,CF		R	11	5.000	EA	R6,8,15,17,40	Yes		
370101-0104A	*1	32	RES, 100K,1/8W,5%,CF		R	11	4.000	EA	R34,42,45,51	Yes		
370101-0100A	*1	33	RES, 10,1/8W,5%,CF		R	22	1.000	EA	R9	Yes		
370101-0203A	*1	34	RES, 20K,1/8W,5%,CF		R	11	4.000	EA	R5,10,12,21	Yes		
370101-0332A	*1	35	RES, 3.3K,1/8W,5%,CF		R	22	2.000	EA	R13,37	Yes		
370101-0132A	*1	36	RES, 1.3K,1/8W,5%,CF		R	11	1.000	EA	R14	Yes		
370101-0152A	*1	37	RES, 1.5K,1/8W,5%,CF		R	22	4.000	EA	R16,48,27,43	Yes		
370102-0010A	*1	38	RES, 1,1/2W,5%,CF		R	11	1.000	EA	R19	Yes		
370201-4700A	*1	39	RES, 0.47,1W,M.O.		R	11	1.000	EA	R18	Yes		
370100-0625A	*1	40	RES, 6.2M,1/4W,5%,CF		R	11	1.000	EA	R20	Yes		
370500-0200A	*1	41	RES, 20,3W,10%,POWER CERA MIC		R	22	4.000	EA	R22,23,24,25	Yes		
370101-0334A	*1	43	RES, 330K,1/8W,5%,CF		R	11	1.000	EA	R28	Yes		
370101-0333A	*1	44	RES, 33K,1/8W,5%,CF		R	22	1.000	EA	R29	Yes		
370101-0471A	*1	45	RES, 470,1/8W,5%,CF		R	11	1.000	EA	R31	Yes		
370101-0331A	*1	46	RES, 330,1/8W,5%,CF		R	22	2.000	EA	R32,33	Yes		
370101-0302A	*1	47	RES, 3K,1/8W,5%,CF		R	11	1.000	EA	R36	Yes		
370101-0223A	*1	48	RES, 22K,1/8W,5%,CF		R	11	1.000	EA	R38	Yes		
370101-0510A	*1	49	RES, 51,1/8W,5%,CF		R	11	1.000	EA	R39	Yes		
370101-0204A	*1	51	RES, 200K,1/8W,5%,CF		R	11	1.000	EA	R41	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401438-0000	PCBA, DEFIB PACER REV. C (E1117)			A				C	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370101-0222A	*1	52	RES, 2.2K,1/8W,5%,CF		R	11	2.000	EA	R44,50	Yes		
370202-2003A	*1	53	RES, 200K,1/8W,1%,MF		N	22	1.000	EA	R46	Yes		
370101-0274A	*1	54	RES, 270K,1/8W,5%,CF		R	11	1.000	EA	R52	Yes		
370101-0511A	*1	55	RES, 510,1/8W,5%,CF		R	22	1.000	EA	R53	Yes		
370101-0753A	*1	56	RES, 75K,1/8W,5%,CF		R	22	1.000	EA	R54	Yes		
401607-0000	*1	57	XFMR, PACER OUTPUT (DEFIB B) **CRITICAL**REV B(E1125		R	22	1.000	EA	T1	Yes		
364000-0008A	*1	58	IC, DG212CJ		R	11	1.000	EA	U1	Yes		
364000-0057A	*1	59	IC, LM324, LINEAR		R	11	1.000	EA	U2	Yes		
364000-0144A	*1	60	IC, LM393N,DUAL COMP		R	33	1.000	EA	U3	Yes		
364000-0016A	*1	61	IC, LM3524, NATIONAL ONLY		R	11	1.000	EA	U4	Yes		
364000-0190A	*1	62	IC, 14490,CONTACT BOUNCE ELIMINATOR		R	22	1.000	EA	U5	Yes		
364000-0189A	*1	63	IC, MC14001B OR 4001B,QUA D 2-INPUT NOR GATE		R	22	1.000	EA	U6	Yes		
364000-0188A	*1	64	IC, MC14013B OR 4013B,DIG ITAL,DUAL TYPE D FLIPFLOP		R	22	1.000	EA	U7	Yes		
364000-0059A	*1	65	IC, 555, TIMER CHIP, LINE AR		R	11	3.000	EA	U8,9,10	Yes		
374402-0203A	*1	66	POT, 20K,MULTI-TURN,SIDE ADJ,CERMET FILM		R	22	1.000	EA	VR1	Yes		
374402-0503A	*1	67	POT, 50K,MULTI-TURN,SIDE ADJ,CERMET FILM		R	22	1.000	EA	VR2	Yes		
374401-0103A	*1	68	POT, 10K,TRIMM,MULTI-TURN ,CERMET FILM (860X)		R	11	1.000	EA	VR3	Yes		
384000-0155A	*1	69	CARD EJECTOR		R	22	2.000	EA	BE1,BE2	Yes		
370101-0512A	*1	70	RES, 5.1K,1/8W,5%,CF		R	11	1.000	EA	R49	Yes		
370101-0224A	*1	71	RES, 220K,1/8W,5%,CF		R	11	1.000	EA	R7	Yes		
352300-0018A	*1	72	CAP, .47UF,10%,MYLAR		R	66	1.000	EA	C26	Yes		
352301-0104A	*1	73	CAP, .1UF,5%,MYLAR		R	66	1.000	EA	C32	Yes		
370101-0183A	*1	74	RES, 18K,1/8W,5%,CF		R	11	1.000	EA	R1	Yes		

RELAY BOARD PCBA

CHAPTER 8

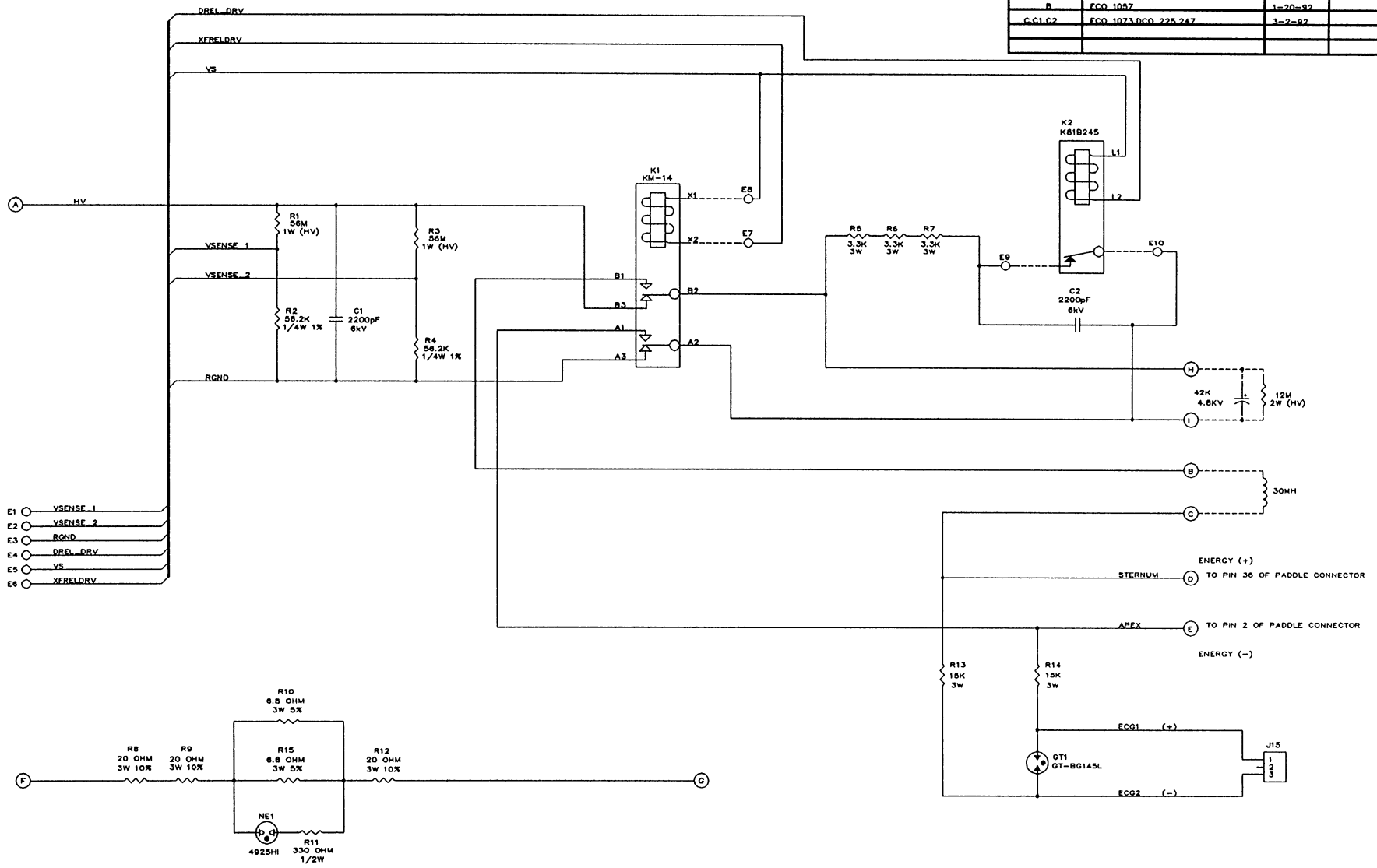
8.0.0 RELAY BOARD

There are two active components located on the relay board. The energy transfer relay which is controlled by the power board and the dump relay which is also controlled by the power board.

There are two dump loads located on the relay board. Resistors R5, R6, and R7 comprise the resistive load for the internal dump relay. Resistors R8, R9, R15, R10, and R12 comprise the resistive load with neon lamp for self test.

Resistors R13 and R14 are in line with amplifiers U7B and U7C located on the isolation board providing paddles ECG signal.

REVISIONS			
LTR	DESCRIPTION	DATE	PCB UPDATE
A	RELEASED ECO # 1000	9-2-91	A 9-2-91
A1,A2,A3,A4	DCO 103,112,182,188	12-20-91	B 1-15-92
B	ECO 1057	1-20-92	
C,C1,C2	ECO 1073,DCO 225,247	3-2-92	



DUMP LOAD

UNUSED LABELS
J1-J14

LAST USED
R15 C2 K2 NE1
GT1 I E10 J15

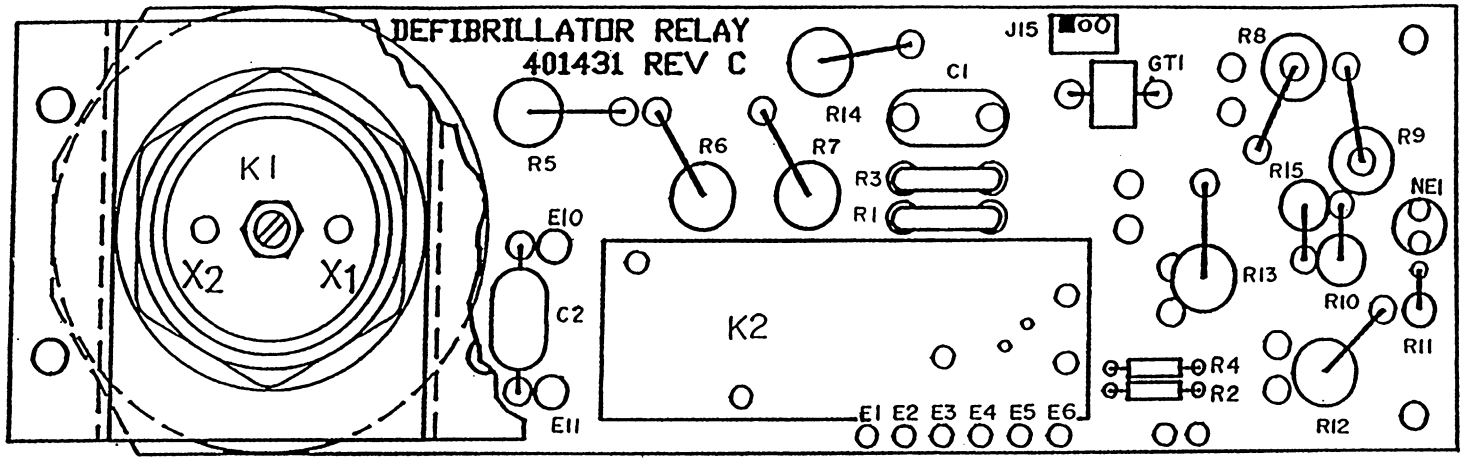
PARTS FLOWN

REV C PCB

NOTE: PARTS FLOWN OR OFF PCB ARE INDICATED BY DASHED LINES.

8-2

TOLERANCES UNLESS OTHERWISE SPECIFIED		MEDICAL DATA ELECTRONICS	
RESISTORS 5% 1/8W CAPACITORS 20%		TITLE: DEFIBRILLATOR RELAY BOARD SCHEMATIC	
APPROVALS	DATE		
DRAWN OSMON	9-2-91		
REVISED SPH	1-16-92		
APPROVED		SCALE FULL / SIZE C / DRAWING NO. 401432 / REV C2	
DEFRELD.SCH		DO NOT SCALE DRAWING	SHEET 1 OF 1



COMPONENT SIDE

WIRING DELETED FOR CLARITY

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
401432-0000	PCBA, DEFIB RELAY REV. C2 (D247)			PCBA	A			TEST	C2	5

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
352102-0222A	*1	9	CAP, .0022uF,6kV,20%,HIGH VOLT,CER DISC		R	22	2.000	EA	C1,C2	Yes		
354000-0253A	*1	14	CONN, HSNG,3-POS,STR,.079 CTR		R	22	1.000	EA	J15	Yes		
360600-0060A	*1	18	TAB, SOLDER .205 X .032 I N THICK		R	22	9.000	EA	7 A,B,C,D,E,F,G,H,I	Yes		
362000-0023A	*1	12	LAMP, NEON 4925H1-C2A		R	22	1.000	EA	NE1	Yes		
370102-0331A	*1	7	RES, 330,1/2W,5%,CF		R	22	1.000	EA	R11	Yes		
370200-5622A	*1	3	RES, 56.2K,1/4W,1%,MF		R	11	2.000	EA	R2,R4	Yes		
370201-0566A	*1	2	RES, 56M,1W,1%,5kV,M.O.		R	22	2.000	EA	R1,R3	Yes		
370400-0680A	*1	6	RES, 6.8,1W,5%,CC		R	22	2.000	EA	R10,15	Yes		
370500-0153A	*1	8	RES, 15K,3W,5%,POWER CERA MIC		R	22	2.000	EA	R13,R14	Yes		
370500-0200A	*1	5	RES, 20,3W,10%,POWER CERA MIC		R	22	3.000	EA	R8,R9,R12	Yes		
370500-0332A	*1	4	RES, 3.3K,3W,10%,POWER CE RAMIC		R	22	3.000	EA	R5,R6,R7	Yes		
380000-0027A	*1	10	RELAY, DPDT (KM14),DEFIB **CRITICAL**		R	33	1.000	EA	K1	Yes		
380000-0028A	*1	11	RELAY, SPST-NC (K81B245), DEFIB		R	33	1.000	EA	K2	Yes		
384000-0158A	*1	13	GAS TUBE SURGE ARRESTOR F IRING VOLT 145V +/-20%		R	22	1.000	EA	GT1	Yes		
385000-0001A	*1	24	PVC TUBING, TEFLON(16GA) .043 IN ID NON. THIN WALL		R	22	0.000	IN.	AS REQUIRED	Yes		
385000-0004A	*1	20	SHRINK TUBING, 1/8in BLAC K VW-1		R	11	5.500	IN.	1 PC 5 1/2"	Yes		
385000-0022A	*1	23	TUBING, TEFLON, 20GA., NATURAL COLOR, STD.WALL		R	11	0.000	IN.	AS REQUIRED	Yes		
385000-0036A	*1	22	RTV COATING, 1 PT. CAN DE FIB		R	22	0.000	EA	AS REQUIRED	Yes		
385000-0037A	*1	21	LACING CORD, BLACK (BUY A S 500-YD SPOOLS)		R	22	9.000	IN		Yes		
399100-0014A	*1	19	WIRE, YELLOW 22GA, PVC,HO OK-UP 1000' MIN PER ROLL		R	11	0.540	FT.	8 (1PC = 6.5" LG)	Yes		
399100-0039A	*1	15	WIRE, GREEN 22GA STRANDED PVC HOOK-UP 1000' MIN		R	22	0.580	FT	6 (1PC = 7" LG)	Yes		
401431-0000	*1	1	PCB, DEFIB RELAY REV. C (C E1078) - UL/CERTS REQ		R	33	1.000	EA	2	Yes		
401469-0000	*1	16	DEFIB RELAY BOARD CABLE A A2 SSY. REV. A2 (D158)		A	6	1.000	EA	3	Yes		

PERFORMANCE AND CALIBRATION

CHAPTER 9

9.0.0 PERFORMANCE AND CALIBRATION CHECK

9.1.0 OVERVIEW

Performance checks are intended to verify proper operation of the M.D.E. Defibrillator/Pacer. In accordance with the guidelines set forth by the institution, a routine for testing equipment which incorporates these checks should be performed. Visual inspection of the mechanical integrity of all cables, paddles, and controls should be performed regularly as indicated below.

Calibration checks and electrical safety measurements should be scheduled and performed in accordance with the institution regularly scheduled preventive maintenance program.

NOTE:

This system contains static sensitive circuitry. Use ESD precautions when handling circuit boards outside of unit.

WARNING:

Do not discharge defibrillator paddles into open air or while shorted together.

WARNING:

This instrument stores high voltage potentials at high energy levels which are potentially lethal. Before servicing this instrument or removing the covers, ensure the storage capacitor has been completely discharged, remove the AC power mains, remove the battery, and remove the paddle assembly.

WARNING:

Improper calibration of this instrument may result in hazardous operation or failure of this device. Calibration of this device must be strictly referred to authorized personnel.

WARNING:

Improper calibration of the defibrillator charging circuit may result in the explosion of the storage capacitor, possibly resulting in serious injury or death. Refer all calibration of this instrument to authorized personnel only.

NOTE:

For performance testing on the **E300A** monitor, consult the **E300A** Service Manual M.D.E. catalog number E9040-03.

NOTE:

The Defibrillator battery must be fully charged to 13.5V before beginning performance testing. The following test equipment is required to perform operational and performance checks:

9.2.0 EQUIPMENT LIST

1. Storage Oscilloscope
2. Function Generator
3. DVM
4. ECG Simulator w/arrhythmia
5. Defibrillator Analyzer
6. 600 Ω 5 watt resistor
7. Electrical Safety Analyzer
8. 1K Ω 5 Watt Resistor
9. Stopwatch
10. Internal Paddle Set
11. Pacer Cable
12. Safety Shield
13. 401445 Extender Card

Recommended Test Conditions:

1. Ambient temperature: 65° to 75°F
2. Relative Humidity: < 40%
3. A.C. Line Voltage 115/60Hz; stable

9.3.0 RECOMMENDED OPERATIONAL CHECKS

These checks are intended to verify proper operation of the ESCORT monitor and defibrillator/pacer. In accordance with the guidelines set forth by the institution, a routine for testing equipment which incorporates these checks should be performed. Visual inspection of the mechanical integrity of all cables, paddles and controls should be performed regularly as indicated below.

EVERY SHIFT

1. Verify that the instruments are connected to AC power, and that the monitor AC ON indicator and defibrillator AC ON indicators are lit.

2. Check for adequate thermal paper in the recorder.

3. Check for presence of ECG leads, electrodes, and adequate defibrillator gel or defibrillator pads. If using "Hands Free" Adapter Cable and Defib/Pace Electrodes for defibrillation and/or pacing, check for the presence of both.

EVERY WEEK

Delivered Energy Check:

1. Place the ENERGY SELECT control in the "200" joules position.

2. Verify that the adult external paddles are installed in holders.

3. Leaving the paddles in their holders, press the front panel CHARGE key. Wait for the charge complete tone to sound and the CHARGE indicator to light.

WARNING: Keep hands clear of the paddle electrode edges; use thumbs to depress DISCHARGE buttons.

4. The rear panel load test lamp should momentarily light to indicate that at least 200 joules were delivered.

SYNCHRONIZED CARDIOVERSION AND RECORDER CHECK:

1. Connect ESCORT monitor ECG cable to a patient simulator and select a low heart rate such as 30 BPM.

2. Press SYNC key to enable synchronization.

3. Observe marker pulses on monitor ECG trace. Confirm that marker pulses fall on or immediately after R-wave, and before T-wave.

4. Press ESCORT monitor RECORD 1 key to record ECG with marker pulses.

5. Select 200 joules of energy using the ENERGY SELECT control.

6. Press CHARGE key to charge defibrillator.

7. Leaving paddles in holders, simultaneously press and hold both DISCHARGE buttons until the next R-wave triggers discharge.

8. Confirm that Unit returns to asynchronous (sync off) mode.

NONINVASIVE PACER CHECK

1. Confirm that QRS indicator on pacer front panel flashes with each ECG R-wave input.

2. Select ASYNC pacing mode. Press the PACE START key to start pacing.

3. Confirm that the CHECK PACE ELECTRODES indicator flashes with the selected pace rate.

4. Confirm that the monitor ECG trace includes pace flags at the selected pace rate.

5. Increase the ECG simulator heart rate to a high rate such as 120 BPM.

6. Select DEMAND pacing mode.

7. Select a pace rate less than the simulated ECG heart rate.

8. Confirm that the CHECK PACE ELECTRODES indicator stops flashing and that pacing flags no longer appear on the monitor ECG trace.

9.4.0 HANDS FREE OPERATION:

A Defibrillator Analyzer is used as a substitute for the patient and serves as a 50 ohm test load during testing procedures.

1. Place the Defibrillator Analyzer on a flat surface and firmly connect the "Hands Free" Adapter Cable.

2. Using the ENERGY SELECT control, charge the defibrillator to 300 joules.

3. Discharge defibrillator into analyzer while observing output values. To do this, simultaneously depress and hold all four discharge buttons on the adapter cable.

Be careful not to touch the defibrillator analyzer during testing procedure. If Analyzer values do not correspond with selected values, check defibrillator or adapter cable for malfunction.

9.5.0 CHECK BATTERIES INDICATION

5.1 With the battery fully charged and the defibrillator plugged into 115 VAC, 60 Hz power, the charge LED should be off and the AC LED (Green) should be on.

5.2 Remove the defibrillator battery and measure the voltage with an open load, the voltage should measure ≈13.0 to 13.5 volts. Reinstall the defibrillator battery.

5.3 Remove the AC power to the defibrillator and note that the defibrillator operates on battery power. With the battery fully charged, note that the battery condition LEDs indicate high and all 3 LEDs are illuminated.

5.4 With the defibrillator on battery power, charge the defibrillator to 360 joules (CAUTION: THE DEFIBRILLATOR IS ARMED!) and discharge this energy into a defibrillator analyzer. Repeat this step twice. With AC power removed, note that the charge LED is not illuminated and the battery condition indicator is in mid-range (middle yellow LED).

Note: *Medical Data Electronics suggests battery replacement every two (2) years regardless of test results. Batteries used beyond life expectancy may fail without notice and could disrupt power to the ESCORT monitor.*

9.6.0 CHECK SYSTEM ON DEFAULT MODE

6.1 With AC power connected, disconnect the paddle assembly remove **E300A** monitor and remove the defibrillator battery.

6.2 Press Power On, a short, rapid audible beep should be heard.

6.3 Check that Power On, ECG leads and AC LEDs are illuminated.

6.4 Note that the battery condition indicators and the battery charge indicators are off.

6.5 If this defibrillator is equipped with the pacer option, note that the Pace Stop and Demand Mode LEDs are illuminated.

6.6 Momentarily press each key and note an audible beep when each key is pressed. Some keys will also give an LED response, note that each LED is illuminating when the key is pressed.

6.7 Press the charge key and note a rapid beep approximately 1 to 5 seconds long. Press the internal paddle discharge key and note a rapid beep approximately 1 to 5 seconds long.

9.7.0 INTERNAL PADDLE AND INTERNAL DISCHARGE FUNCTIONS

7.1 With AC power connected and the battery removed, connect the Internal Paddles Assembly to the defibrillator and set the energy select to 5 joules.

7.2 Press the charge key. The charge LED should illuminate steady and a solid audible tone should be present within about one second. **(CAUTION: THE DEFIBRILLATOR IS ARMED!)**

7.3 Place the paddles on a defibrillator analyzer and press internal paddle discharge.

7.4 The defibrillator analyzer should display 5 joules ± 4.

7.5 With the energy select set at 5 joules, press the charge key, wait until the charge LED is continuously illuminated **(CAUTION: THE DEFIBRILLATOR IS ARMED!)**.

7.6 Note at 32 seconds, a fast beep alarm tone is generated indicating the half way point to auto discharge is reached.

7.7 Note that at 64 seconds ± 1, the defibrillator will internally dump the stored energy, at which time the charge LED should not be illuminated and the audible charge tone should stop.

7.8 With internal paddles connected, set energy select to 100 joules, and press charge. A rapid alarm tone should be heard, note that the flashing charge LED does not illuminate and that the defibrillator does not charge.

7.9 Set energy select to 50 joules, press charge, a 2 Hz beep should be heard and the charge LED should flash while charging. When the defibrillator is charged, the charge LED should stop flashing and become continuously illuminated and the pulsing tone should become a solid tone. **(CAUTION: THE DEFIBRILLATOR IS ARMED!)**

7.10 Without discharging the defibrillator, set the energy select to 100 joules. Note that the defibrillator has dumped the charge internally. The charge LED should not be illuminated and the continuous audible tone should stop.

9.8.0 External Paddles Check

8.1 With AC power connected and the battery removed, disconnect the internal paddles assembly and install the external paddles assembly.

8.2 Set the energy select to 100 joules and charge the defibrillator using the charge button on the apex paddle assembly. Note the charge LED flashing with a pulsed audible tone until the defibrillator is charged. When the defibrillator is charged (armed) the charge LED on the front panel and on the sternum paddle will be illuminated continuously and the pulsing audible tone will become continuous. **(CAUTION: THE DEFIBRILLATOR IS ARMED!)**

8.3 NOTE: Charge will degrade over time.

Discharge the defibrillator using the external paddles assembly in to a defibrillator analyzer, the analyzer should display 99 to 101 joules. If the defibrillator analyzer is reading less than 99 joules or greater then 101 joules, follow the disassembly instructions (located in the disassembly chapter) for removing the bottom cover and install the safety shield as described in the disassembly chapter. Adjust VR2 located on the power PCBA. Note: adjusting VR2 clockwise will increase the energy level.

WARNING:

This instrument stores high voltage potentials at high energy levels which are potentially lethal.

WARNING:

Improper calibration of this instrument may result in hazardous operation or failure of this device. Calibration of this device must be strictly referred to authorized personnel.

WARNING:

Improper calibration of the defibrillator charging circuit may result in the explosion of the storage capacitor, possibly resulting in serious injury or death. Refer all calibration of this instrument to authorized personnel only.

8.4 Repeat the above steps until the delivered energy is between 99 and 101 joules.

8.5 Set the ENERGY SELECT to 360 joules and press the charge key. The charge time should not exceed 10 seconds. **(CAUTION: THE DEFIBRILLATOR IS ARMED!)** Discharge the defibrillator into a defibrillator analyzer and note the defibrillator analyzer should read 360 joules ± 15% or ± 4 joules, whichever is greater.

8.6 Remove the AC power from the defibrillator and install a fully charged battery into the defibrillator. Set the ENERGY SELECT to 360 joules and press the charge key. **(CAUTION: THE DEFIBRILLATOR IS ARMED!)** Note that the charge time on battery power is less than 11 seconds. If the charge time on battery power is greater than 11 seconds, adjust VR3 on the power PCBA. Note: Adjusting VR3 clockwise decreased defibrillator charge time.

WARNING:

This instrument stores high voltage potentials at high energy levels which are potentially lethal.

WARNING:

Improper calibration of this instrument may result in hazardous operation or failure of this device. Calibration of this device must be strictly referred to authorized personnel.

WARNING:

Improper calibration of the defibrillator charging circuit may result in the explosion of the storage capacitor, possibly resulting in serious injury or death. Refer all calibration of this instrument to authorized personnel only.

8.7 Apply AC power and verify charge and discharge of all energy levels. Verify the delivered energy into a defibrillator analyzer is within ± 15% or ± 4 joules of the energy level selected.

9.9.0 Disarm and Automatic Energy Up-Date

9.1 With AC power connected, set ENERGY SELECT to 5 joules and press the charge key **(CAUTION: THE DEFIBRILLATOR IS ARMED)**. Press the DISARM key and observe an internal energy discharge. The CHARGE LED should be off and the continuous audible tone should stop.

9.2 Set the ENERGY SELECT SWITCH to 5 joules and press the charge key. When the charge LED is continuously illuminated and the audible tone is constant, change the ENERGY SELECT SWITCH to 360 joules. **(CAUTION: THE DEFIBRILLATOR IS ARMED!)** The charge LED should flash and the audible tone should pulse until the defibrillator has charged to 360 joules. When the defibrillator has charged to 360 joules, discharge the defibrillator into a defibrillator analyzer and verify 360 joules were delivered ± 15% or ± 4 joules, whichever is greater.

9.3 Set the ENERGY SELECT control to 360 joules and press the charge key. **(CAUTION: THE DEFIBRILLATOR IS ARMED!)** When the defibrillator has charged, set energy select to 5 joules. Note that the 360 joules stored energy is internally discharged to 5 joules. Discharge the defibrillator into a defibrillator analyzer and verify the delivered energy is 5 joules ± 15% or 4 joules, whichever is greater.

CAUTION: DO NOT REPEAT THE ABOVE STEPS MORE THAN TWICE IN A 60 SECOND PERIOD!

9.10.0 Energy Wave Form

10.1 Connect a storage oscilloscope to the real time output of a defibrillator analyzer. Set the oscilloscope for 1 volt/division and the sweep speed for 2ms. Also set the oscilloscope for storage mode, single sweep.

10.2 Set the ENERGY SELECT control on the defibrillator to 360 joules and press the CHARGE KEY. **(CAUTION: THE DEFIBRILLATOR IS ARMED!)** When the defibrillator has charged, discharge the defibrillator into a defibrillator analyzer (observe the correct polarity of the paddles on the defibrillator analyzer).

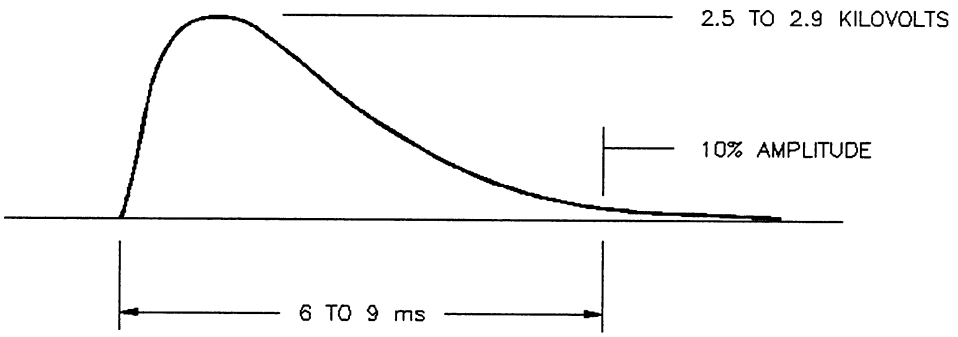


FIGURE 9.1

Waveform displayed on oscilloscope (the scale is 1000:1).

9.11.0 COMMON MODE REJECTION

11.1 Press defibrillator STDBY key and remove AC power. Following the disassembly instructions, remove the bottom cover and install the safety shield as described in the disassembly chapter.

WARNING:

This instrument stores high voltage potentials at high energy levels which are potentially lethal.

WARNING:

Improper calibration of this instrument may result in hazardous operation or failure of this device. Calibration of this device must be strictly referred to authorized personnel.

11.2 Remove isolation board as discribed in disassembly chapter and install safety shield. Install extender board, MDE part number 401445, and then install the isolation board into the extender board.

11.3 Set up a function generator for 6V P-P, sinewave output, 55 Hz. Connect the active signal lead (+ lead) to both defibrillator paddle plates. Connect the signal ground lead to iso ground (center tap of iso transformer pin 3 of T1, located on the isolation board). Connect oscilloscope to pin 14 of U7 on isolation board.

11.4 Install a fully charged battery. NOTE: Unit must operate on battery power. Turn on the defibrillator and adjust VR1 on the isolation board for the lowest possible amplitude (300 mv or less).

11.5 Turn off defibrillator and remove the extender board and reinstall the isolation board.

11.6 If the defibrillator is not equipped with the pacer option/reinstall the bottom cover as described in the disassembly chapter.

9.12.0 ECG PADDLE POLARITY

12.1 With the **E300A** monitor installed on the defibrillator, connect patient simulator left leg lead to the defibrillator apex paddle and connect the right arm lead from the patient simulator to the sternum paddle. Turn on the defibrillator and **E300A** monitor and press the ECG paddles key. Note the polarity of R-wave displayed on the **E300A** monitor is correct.

9.13.0 SYNC AND CARDIOVERSION

13.1 With the defibrillator connected to AC power and the defibrillator power on, press the LEADS key. Connect the **E300A** monitor ECG patient cable to a defibrillator analyzer (Dynatech Nevada Impulse 3000 or equivalent) with left arm, right arm left leg (Lead II). Note the polarity of the wave form is correct.

13.2 With the defibrillator connected to AC power and the defibrillator power on press the SYNC KEY. Connect the **E300A** monitor ECG patient cable to a defibrillator analyzer left arm, right arm and left leg (Lead II). Note the triangle wave form with a sync flag on the **E300A** display. Configure the defibrillator analyzer to measure cardioversion delay time. Set the energy select to 50

joules and press the CHARGE KEY. **(CAUTION: THE DEFIBRILLATOR IS ARMED!)** Discharge the defibrillator into the defibrillator analyzer. Note that less than 60 ms of delay time between the downslope of the last R wave to discharge is displayed. Note that the sync LED is off after the defibrillator has been discharged.

9.14.0 Pacer Start/Stop

14.1 With **E300A** monitor mounted on defibrillator/pacer, connect the **E300A** monitor ECG patient cable left arm, right arm, and left leg (Lead II) to an ECG simulator. Connect the pacer cable across a 600Ω 5 watt resistor. Press the PACER START key, note that the pace start LED is blinking while the pacemaker is active. Press PACE STOP key. Note the PACE STOP LED is illuminated and the PACE START LED is off. Press the PACER MODE key and note the ASYNC LED and DMAND LED toggle each time the mode key is pressed. Also note that the QRS LED flashes with the ECG signal as seen on the display of the **E300A** monitor.

9.15.0 ECG Paddles Lockout

15.1 With the defibrillator power on, set the ECG to paddles mode by pressing the ECG key until the paddle LED illuminates. Press the PACE START key until the start LED illuminates. Note that the paddles LED is off and the leads LED is illuminated. By pressing the ECG key note that the paddles LED will not illuminate while the pacer is operating.

9.16.0 Pacer Rate

16.1 Remove the **E300A** monitor from the defibrillator base. Connect the **E300A** monitor ECG input and the pacer output to the circuit shown below in Figure 9.2. Switch the test circuit to 600Ω load. Turn on the **E300A** monitor and select Lead II (if the **E300A** is equipped with a 5 lead ECG option). Set the pacer current to 60 mA. Set the rate to 40 PPM. Press the defibrillator POWER ON key and press the PACER START. The monitor should display PR 40 (pulse rate).

Pacer Rate Test Circuit

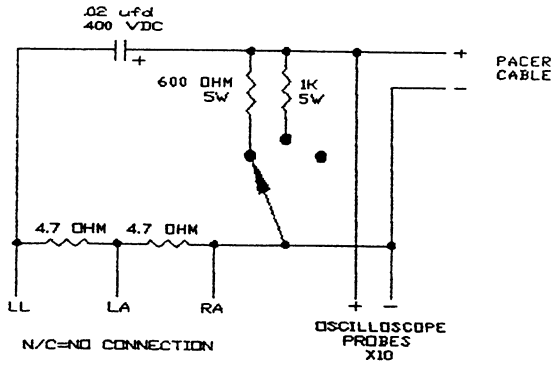


FIGURE 9.2

16.2 Set the pacer rate to 60 PPM, 70 PPM, and all rates through 160 PPM. The **E300A** monitor should display PR (pulse rate) of selected rate on Pacer ± 3% or 3 PPM. If the pulse rate displayed on the **E300A** monitor is not within 3% or 3 PPM of the set rate on the pacer module, adjust VR3 on the pacer board. Turn the defibrillator off, unplug AC power and remove battery. Remove the bottom cover by following the disassembly instructions located in the disassembly chapter of this manual for removing the defibrillator bottom cover and install the safety shield as described.

WARNING:

This instrument stores high voltage potentials at high energy levels which are potentially lethal.

WARNING:

Improper calibration of this instrument may result in hazardous operation or failure of this device. Calibration of this device must be strictly referred to authorized personnel.

16.3 If calibration of the Pacer Pulse Rate is required, remove the pacer board and install extender board, then reinstall the pacer board on the extender board. Reconnect the defibrillator to AC power and press the POWER ON key. Using the pacer rate test circuit connected as described in Figure 9.2, press the PACER START key. Adjust VR3 until the pulse rate (PR) displayed on the **E300A** is within 3% or 3 PPM of the set rate on the pacer module. Note rotating VR3 clockwise decreases pulse rate. Verify each setting on the pacer rate switch after adjusting VR3 to be within ± 3% or 3 PPM.

9.17.0 Pace Current

17.1 Using test circuit shown in Figure 9.4, set up an oscilloscope for 10 volts/div and a sweep of 5 mS/div. Connect the pacer leads to the test circuit as shown in Figure 9.4 observing proper polarity.

17.2 Set the pacer rate for 100 PPM and the power current for 60 ma, 36.0 volts ± 6.0 volts should be observed on the oscilloscope at the measuring point shown below in Figure 9.3. The width of the pulse should be 22 ms ± 2 ms.

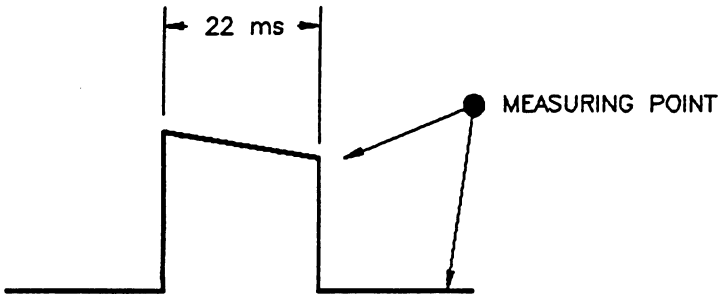


FIGURE 9.3

17.3 If the measured value is not 36 ± 6 volts, adjust VR2 until 36 ± 6 volts is observed on the oscilloscope.

17.4 Set pacer current for 120 ma, 72 ± 7.2 volts should be observed at the measurement point. If 72 ± 7.2 volts is not measured, adjust VR1 until measured value is correct. Note there is an interaction between VR1 and VR2.

17.5 Press the defibrillator STDBY key and remove AC power and the battery from the defibrillator. Remove the pacer board. Remove the extender board and reinstall the pacer board. Remove the safety shield and reinstall the defibrillator bottom cover as described in the disassembly chapter.

9.18.0 Demand Mode

18.1 Reinstall the **E300A** monitor on the defibrillator base. Connect AC power and install the battery into the defibrillator. Connect the **E300A** ECG cable to an arrhythmia simulator with a Lead II configuration (left leg, left arm, and right arm). Press the defibrillator POWER ON key, then press MODE KEY to toggle into DEMAND MODE. With an NSR (normal sinus rhythm) set the simulator rate to 70 BPM. Set the pacer rate to 80 PPM. Press the PACER START key. Observe the pacer is constantly pacing. Set the pacer rate for 60 PPM. Observe pacing stopped. Set arrhythmia simulator for one PAC, observe one pace pulse for each PAC.

18.2 Verify that the "CHECK PACE ELECTRODES" LED illuminates when pace electrodes are disconnected.

18.3 Using test circuit shown below switched to 600Ω load and connect as shown. Set pacer current to 180 ma. Press defibrillator POWER ON key and press PACER START. Note that check pace electrode does not flash. Switch the test circuit to 1KΩ 5 watt resistor and set pace current to 130 ma, note that the check pace electrode is flashing.

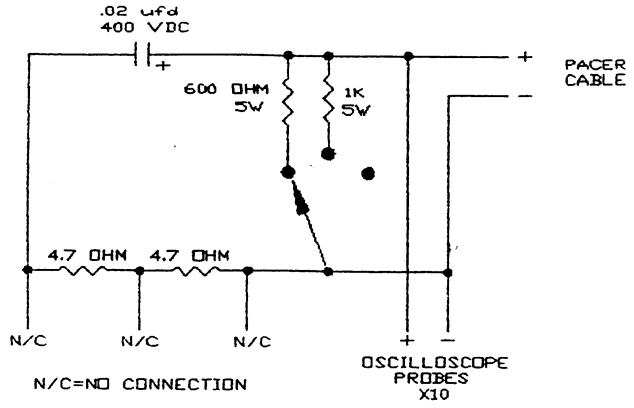


FIGURE 9.4

9.19.0 Voltage Compliance

19.1 Using the test circuit shown below (Figure 9.5) with no load resistance in the circuit, using a X10 probe, connect to oscilloscope set for 5 volts/div and sweep 5 ms. Observe 225 to 275 volts on the oscilloscope at the measurement point.

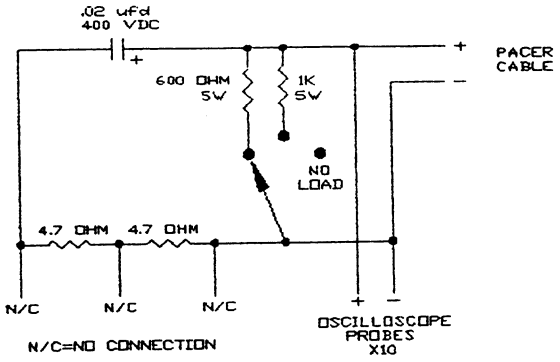


FIGURE 9.5

Test Circuit

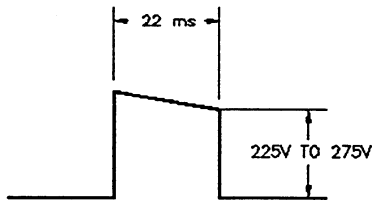


FIGURE 9.6

Point of Measurement

9.20.0 Pacer Defib Priority

20.1 Press defibrillator POWER ON key and press PACER START key. Select 5 joules on defibrillator. Press CHARGE key. **(CAUTION: DEFIBRILLATOR IS ARMED!)** Note that the pacer has switched to stop. Press the defibrillator DISARM key.

9.21.0 Leakage Testing

21.1 NOTE: All leakage tests are usually accomplished with a meter specifically designed for making this measurement on medical equipment. For safety reasons, do not attempt these measurements unless this type of instrument is available.

21.2 See **E300A** Service Manual for leakage testing on the **E300A** monitor.

9.22.0 Ground Resistance Measurement

22.1 Test for ground continuity between AC cord cap U ground (ground pin on power cord) and chassis at unpainted metal screw head on rear panel. The power cord grounding resistance should be ≤ .15 Ω.

9.23.0 Chassis Leakage Current Measurement

23.1 Using a commercially manufactured medical electrical safety analyzer, the measured leakage current between chassis and ground with the ground conductor open is ≤ 100 μA. The above measurement should be made powering the unit with normal polarity and then switching to reverse polarity, power on and STDBY.

23.2 With the defibrillator set in the paddles mode with an electrical safety analyzer, measure the leakage current from the paddles to ground. The measured leakage current should be ≤ 100 μA.

23.3 With the defibrillator power on and the pacer in stop mode, using an electrical safety analyzer, measure the leakage current between the pacer leads and ground. The measured value should be ≤ 20 μA.

23.4 With the defibrillator internal paddles connected, using an electrical safety analyzer, the leakage current measured between the internal paddles and ground should be ≤50 μA.

9.24.0 Energy Select Knob Check

24.1 With AC power OFF, rotate the energy select knob to ensure that each setting snaps firmly into place.

PERFORMANCE CHECKLIST

Technician_____ Model_____

Location_____ Serial Number_____

Date_____

Check Battery Functions.....OK_____

****ALWAYS SET ENERGY SELECT TO 2 or 5 JOULES AFTER EACH STEP****

Check system default.....OK_____

Check CHARGE and INTNL PADDLE DISCHG (no paddles).....OK_____

Internal paddle and auto internal discharge tests.....OK_____

External paddle and auto internal discharge tests.....OK_____

Set Energy Level and Charge Time (100-103 Joules 9 sec).....OK_____

Check all energy levels (± 4 Joules or ± 15% of Selected Energy).....OK_____

ENTER ACTUAL TEST MEASUREMENTS

2 Joules_____Joules	20 Joules_____Joules	150 Joules_____Joules
3 Joules_____Joules	30 Joules_____Joules	200 Joules_____Joules
5 Joules_____Joules	50 Joules_____Joules	300 Joules_____Joules
10 Joules_____Joules	100 Joules_____Joules	360 Joules_____Joules

Check DISARM function and Automatic Energy Update.....OK_____

Check Internal Load (@200 Joules check lamp on rear panel).....OK_____

Check Discharge Energy waveform.....OK_____

Adjust Paddle CMRR.....OK_____

Verify Paddle ECG polarity.....OK_____

Verify Sync Operations (Cardioversion delay < 60ms).....OK_____

EXTERNAL PACER CHECKOUT

Check PACE START-STOP, ASYNC-DEMAND and QUS LED'S.....OK_____

Check PADDLES ECG lockout.....OK_____

Check PACE rate accuracy (± 3 PM).....OK_____

ENTER ACTUAL TEST MEASUREMENTS

40 PPM.....	_____PPM	90 PPM.....	_____PPM
60 PPM.....	_____PPM	100 PPM.....	_____PPM
70 PPM.....	_____PPM	120 PPM.....	_____PPM
75 PPM.....	_____PPM	140 PPM.....	_____PPM
80 PPM.....	_____PPM	160 PPM.....	_____PPM

ASYNC Mode (HR + 140 BPM, PACE Rate = 100 BPM) Constant Pacing.....OK_____

DEMAND MODE:

HR = 70, PACE = 80, Constant Pacing.....OK_____

HR = 70, PACE = 60, No Pacing.....OK_____

HR = 70, PACE = 60, 1 PAC = 1 PACE.....OK_____

Check PACE Current (Check Voltage at Trailing Peak into 600 ohm Load)

60 mA = 36.0 V (Calibrate ± 2 V and Test ± 20 %).....OK_____

90 mA = 54.0 V (Calibrate ± 2 V and Test ± 20 %).....OK_____

120 mA = 72.0 V (Calibrate ± 2 V and Test ± 20 %).....OK_____

Verify CHECK PACE ELECTRODES LED Operation (into 1k ohm Load)...OK_____

Voltage compliance (225 to 275 Volts Peak without load).....OK_____

Check PACE/DEFIB Priority.....OK_____

ELECTRICAL SAFETY

All covers screws in place.....OK_____

Power Cord Ground resistance (0.150 ohms maximum).....OK_____

System current at nominal line voltage (1.15 A maximum).....OK_____

Leakage Tests:

System Chassis (100 µA maximum, including E300A).....OK_____

E300A ECG Leads (20 µA maximum).....OK_____

DEFIB External Paddles (100 µA maximum).....OK_____

DEFIB Internal Paddles (50 µA maximum).....OK_____

Technician Signature_____

MECHANICAL DISASSEMBLY

CHAPTER 10

10.0.0 MECHANICAL DISASSEMBLY

WARNING:

Do not discharge defibrillator paddles into open air or while shorted together.

WARNING:

This instrument stores high voltage potentials at high energy levels which are potentially lethal. Before servicing this instrument or removing the covers, ensure the storage capacitor has been completely discharged, remove the AC power mains, remove the battery, and remove the paddle assembly.

WARNING:

Improper calibration of this instrument may result in hazardous operation or failure of this device. Calibration of this device must be strictly referred to authorized personnel.

WARNING:

Improper calibration of the defibrillator charging circuit may result in the explosion of the storage capacitor, possibly resulting in serious injury or death. Refer all calibration of this instrument to authorized personnel only.

WARNING:

This device contains lethal potentials and an explosion hazzard when the bottom cover is removed. Always make sure a safety shield is installed properly.

NOTE:

When replacing PCBA's, refer to the board placement diagram at the end of this chapter.

10.1.0 Fuse Replacement: Two, 2 amp slo blo fuses are located in the power module at the rear panel. They are removed by prying the tab at the lower right corner with a small blade screw driver. Pull out fuse holder. Lift on slender black tab, while pulling out clear plastic assembly. To replace, insert clear plastic assembly until a click is heard, then replace holder.

10.2.0 Bottom Cover Removal: Remove 12 Phillips head screws as shown below in Figure 10.1. Lift off bottom cover. Install safety shield.

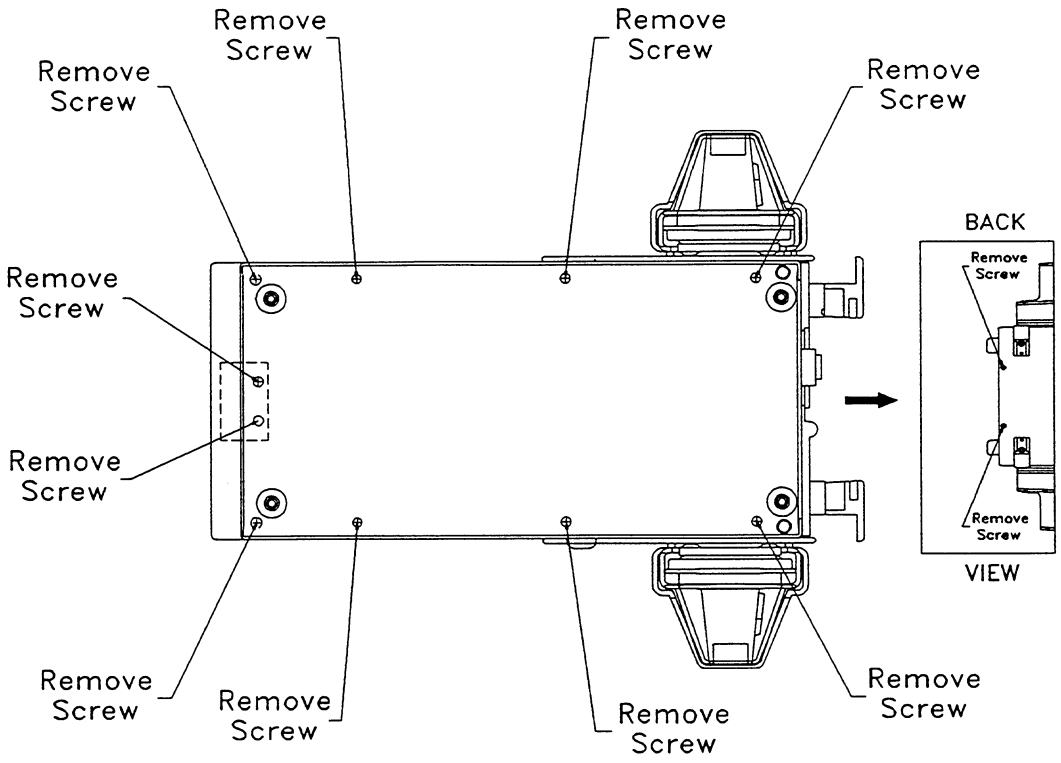


FIGURE 10.1

10.3.0 Bezel Assembly Removal: Remove four bottom screws and two top screws, as shown below in Figure 10.2.

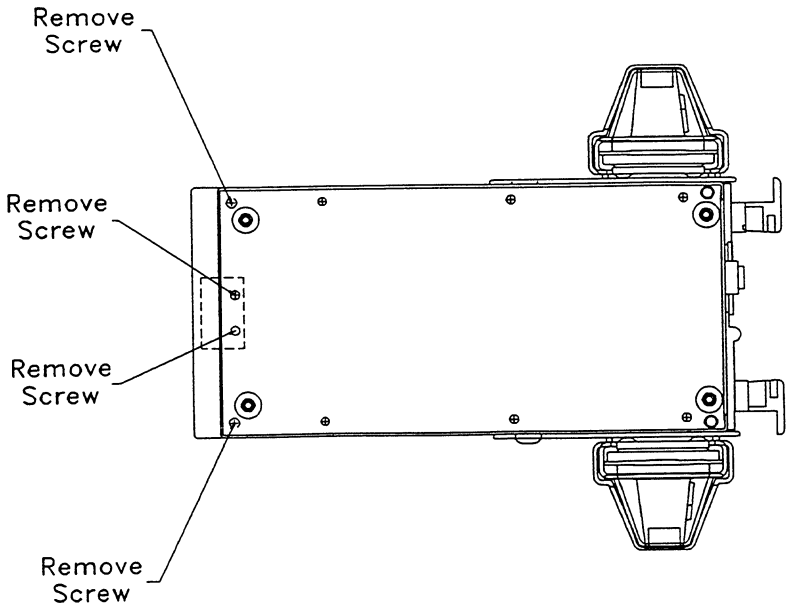


FIGURE 10.2

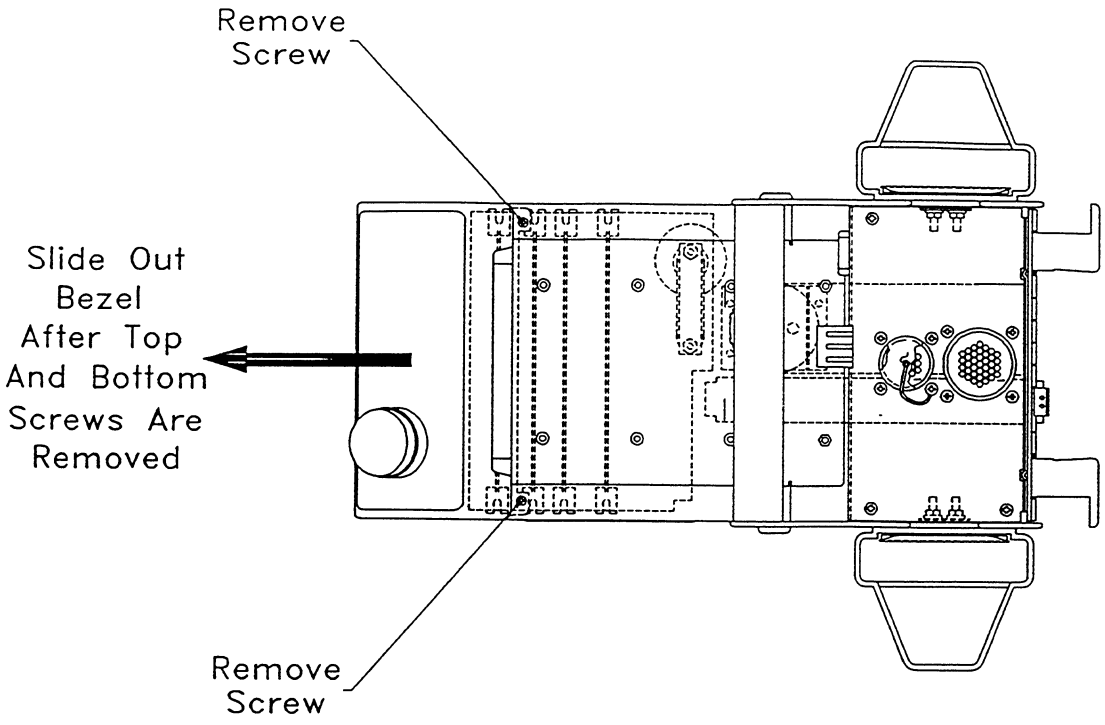


FIGURE 10.3

Slide the bezel assembly out the front of the defibrillator. Carefully remove ribbon connectors J9 and J7. Remove connectors J5, J6, and J8.

10.4.0 <u>Remove Pacer Board</u>

Remove bottom cover as previously described. Life extractor tabs as shown below (see illustration at the end of this chapter for PC board location), Figure 10.19. Remove connectors J and K. Lift board out of card guides by holding extractor tabs. See Figure 10.4 below.

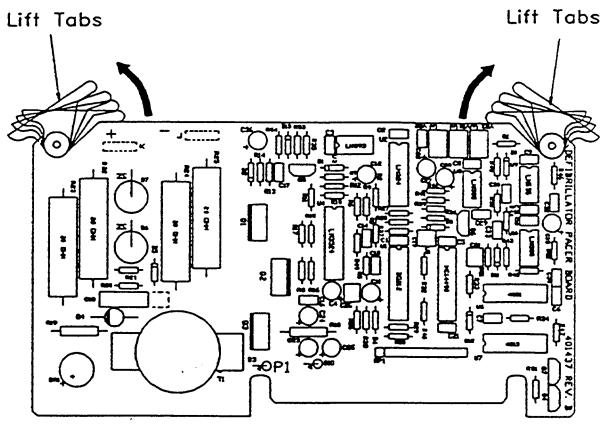


FIGURE 10.4

10.5.0 Remove Logic Board
Remove bottom cover as previously described. Lift board extracter tabs as shown below (see illustration at the end of this chapter for PC board location), Figure 10.19. Lift logic board out of card guides by holding on to extractor tabs. Remove Fish Paper. See Figure 10.5 below.

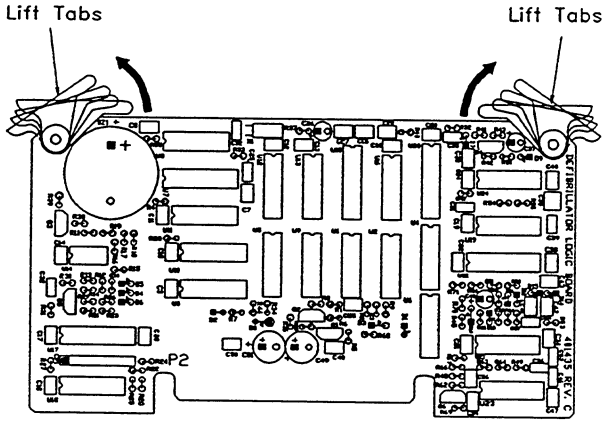


FIGURE 10.5

10.6.0 Remove Iso Board
Remove bottom cover as previously described. Lift extractor tabs as shown below (see illustration at the end of this chapter for board location), Figure 10.19. Remove connector J16. Life board out of card guides by holding extractor tabs. See Figure 10.6 below.

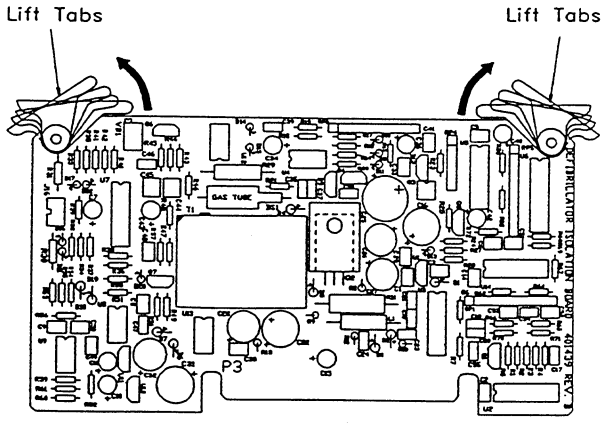


FIGURE 10.6

10.7.0 Remove Power Board

Remove bottom cover as previously described. Lift extractor tabs as shown below (see illustration at the end of this chapter for P.C. board location), Figure 10.19. Lift board out of card guides by holding extractor tabs. See figure 10.7 below.

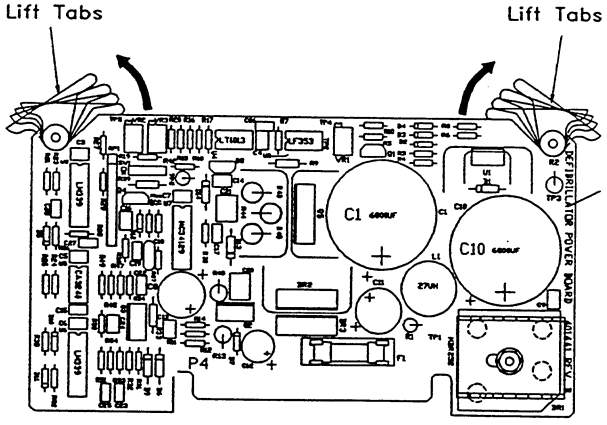


FIGURE 10.7

10.8.0 Remove Mother Board Assembly

Remove bottom cover as previously described. Remove pacer board, logic board, isolation board, and power board as previously described (see illustration at the end of this chapter for board location), Figure 10.19. Remove bezel assembly as previously described. Remove conenctors J5, J6, J7, J8, J9, J10, J11, J12, J13, J14 and lead A (flyback transformer lead connected to the relay board).

Remove seven screws from the mother board assembly as shown below in Figure 10.8.

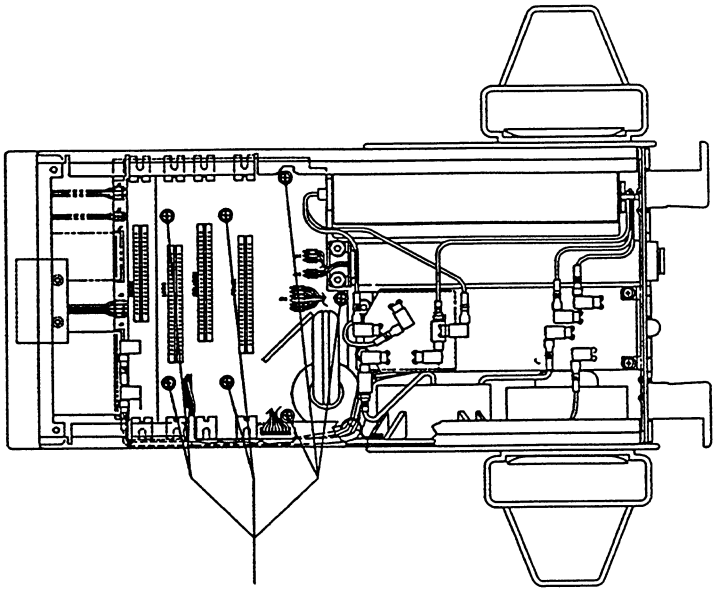


FIGURE 10.8

Lift and slide mother board assembly out the front of the defibrillator through the bezel opening.

10.9.0 Remove Relay Board Assembly

Remove pacer board, logic board, isolation board, power board, and mother board as described in previous steps. Remove back screws to relay board as shown below. Remove back screw to battery housing. Remove two back panel lower feet as shown below. Remove five screws as shown below in Figure 10.9.

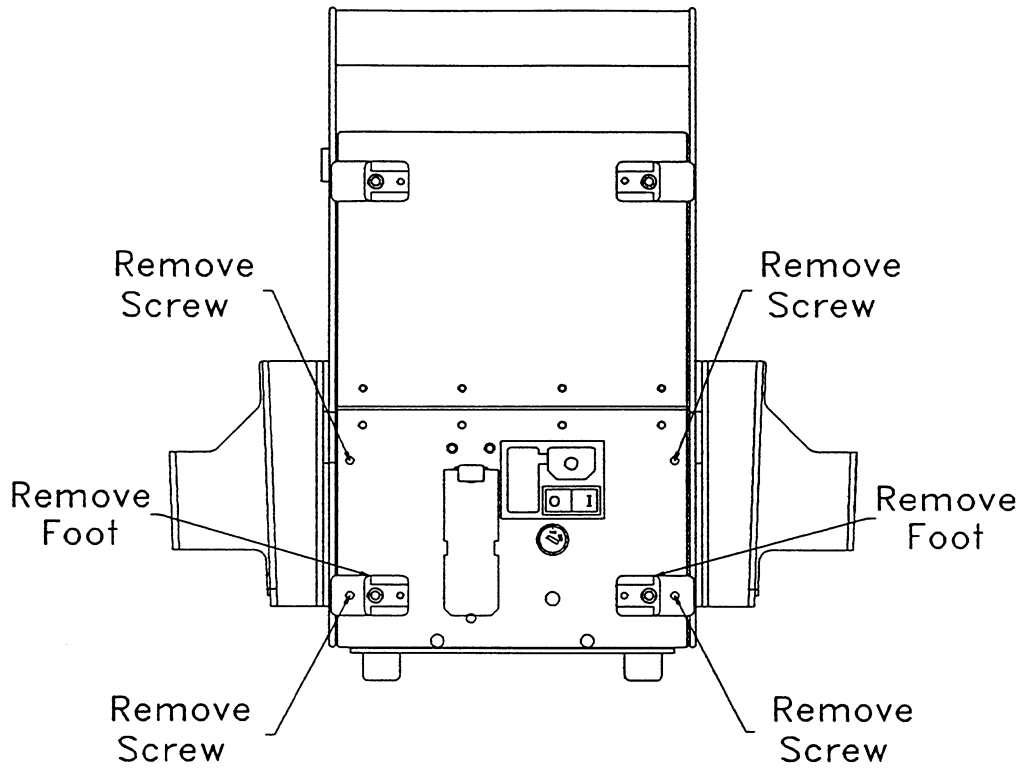


FIGURE 10.9

Disconnect connector P-17. Remove back panel. Remove four nuts securing relay board, (see illustration below), Figure 10.10.

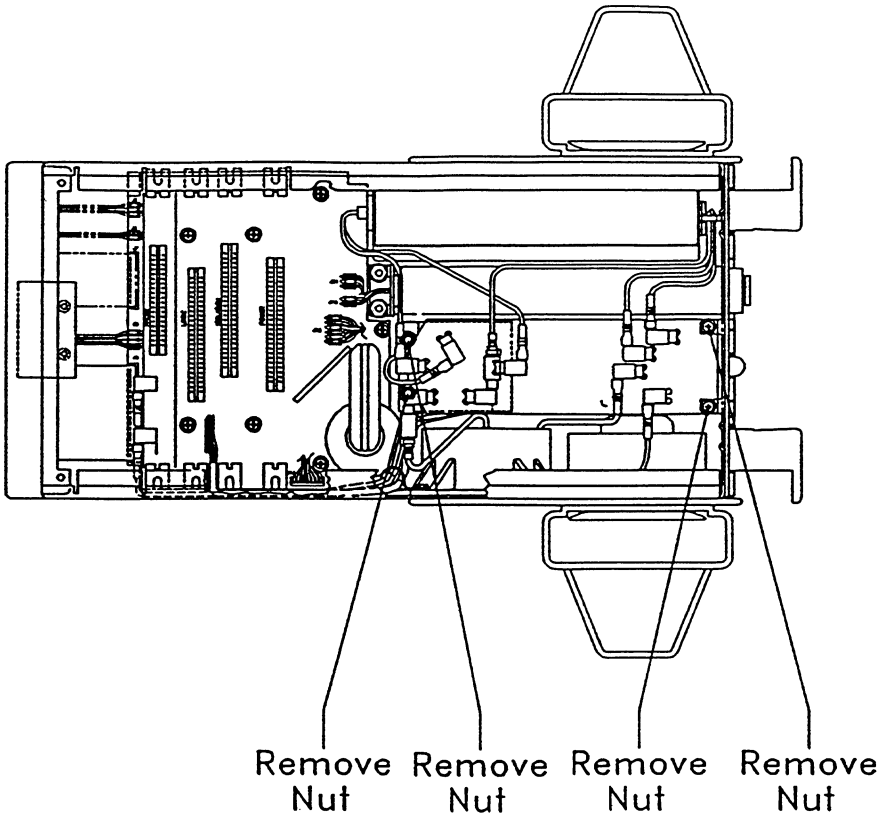


FIGURE 10.10

Remove terminals A, B, C, D, E, F, G, H, and I. Lift relay board up and out of defibrillator.

10.10.0 Remove Battery Housing

Following the above steps, remove the mother board and relay boards and back panel. Remove two hex nuts as shown in the illustration below in Figure 10.11.

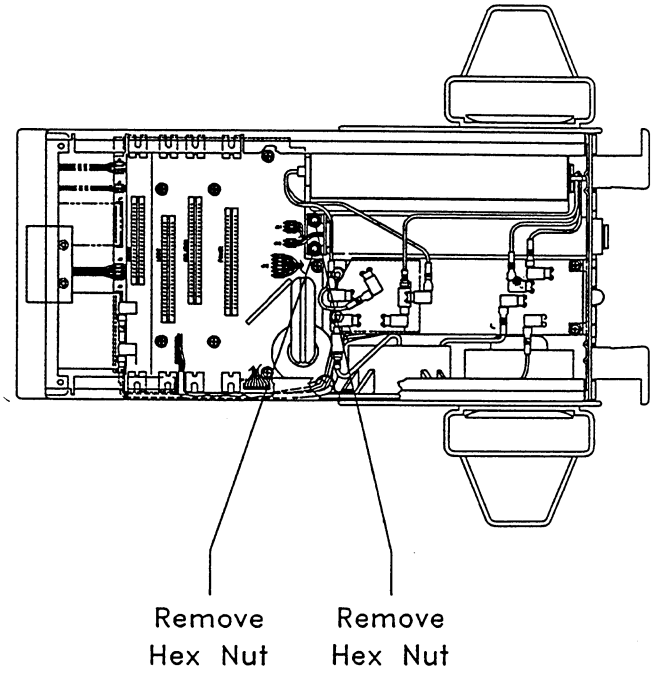


FIGURE 10.11

Lift battery housing out of defibrillator.

10.11.0 Remove Capacitor Assembly

Remove the mother board assembly, relay board, back panel assembly, and battery housing as described in the previous steps.

Remove four hex studs and washers as illustrated below, in Figure 10.12.

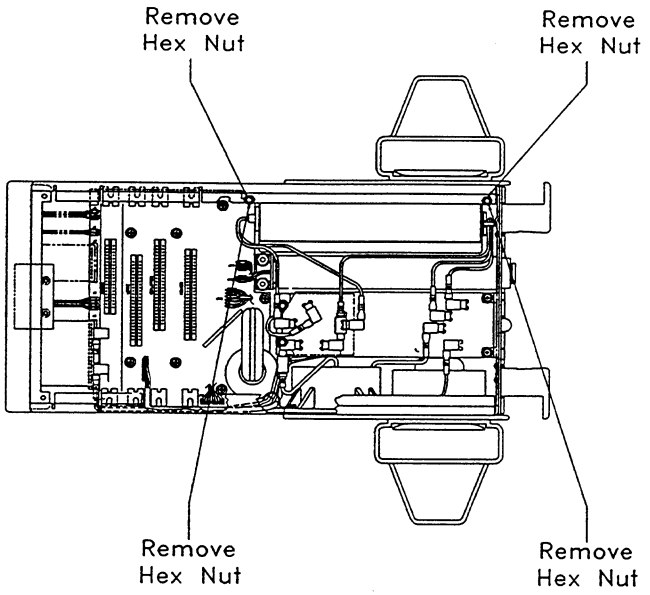


FIGURE 10.12

Slide capacitor assembly into the center of the defibrillator. Lift capacitor assembly out of defibrillator. Remove tie wrap on back of cap to remove.

10.12.0 Remove Paddle Holsters

Remove back plate using previous mentioned steps. Remove four hex nuts which secuare discharge plates, (see illustrations below), in Figure 10.13.

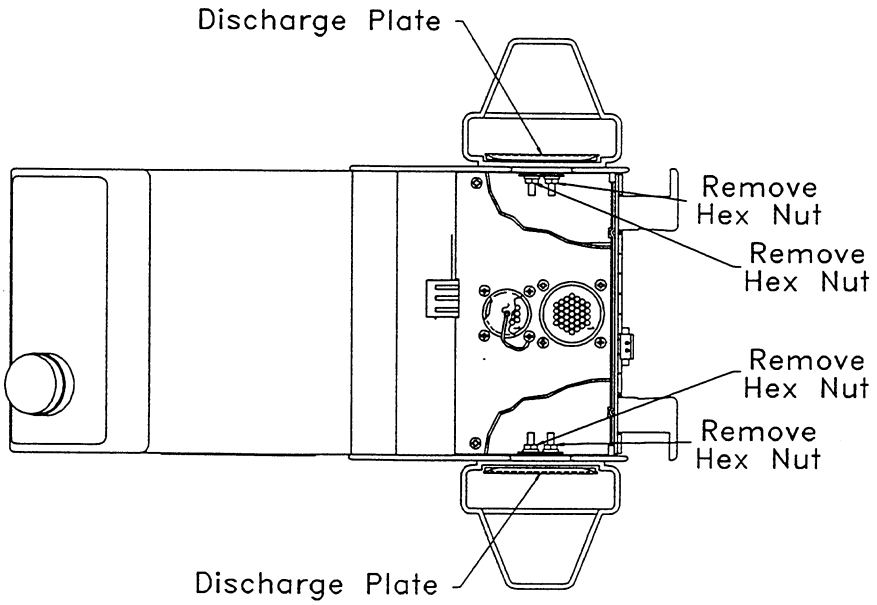


FIGURE 10.13

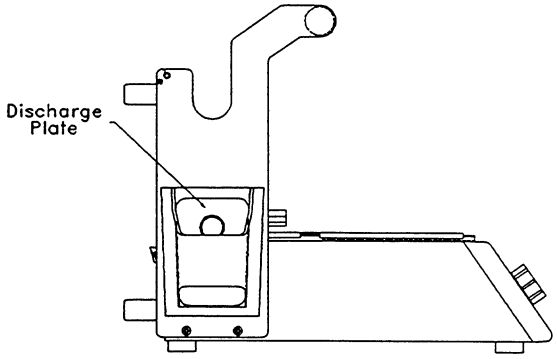


FIGURE 10.14

After hex nuts are moved from discharge plates, lift discharge plate out of each holster assembly. Remove two Phillips head screws from the opening of each holster. Lift holster away from handle assembly.

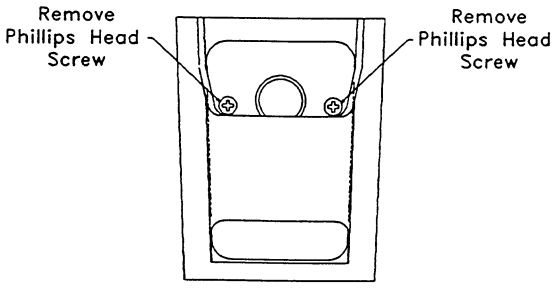


FIGURE 10.15

10.13.0 <u>Remove Handle Assembly</u>

Following the previously described steps, remove the paddle holster assembly.

Remove the two screws on each side of defibrillator as shown below, SEE FIGURE 10.16. Life handle assembly up and away from defibrillator.

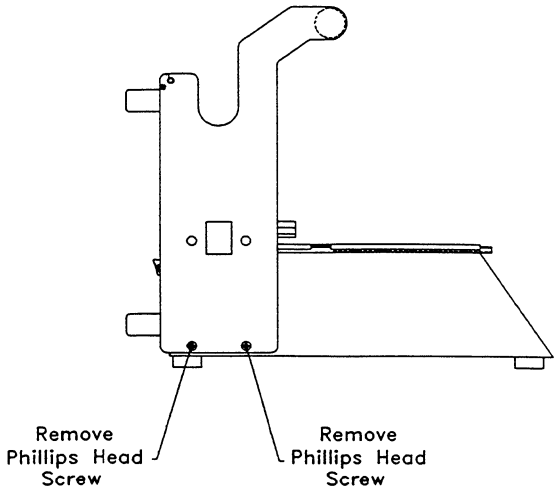


FIGURE 10.16

10.14.0 Remove Power Transformer
Remove bottom cover.

Remove back panel assembly, and relay board assembly as described in previous steps. Remove 4 Phillips head screws and lift power transformer out of defibrillator. Remove one screw in pacer connector. Remove two tie wraps. Remove AC power connector for **E300A.**

10.15.0 Remove Defibrillator Coil Assembly
Remove bottom cover and remove relay assembly as described in previous steps. Remove four hex nuts securing coil assembly to defibrillator skin assembly. Lift coil out of defibrillator. NOTE: About location of cable guide (which screw).

10.16.0 Remove Monitor Slide Plate
Remove mother board assembly, battery housing, relay board assembly, and capacitor assembly as described in previous steps.

Remove six Phillips head screws. Lift slide plate off defibrillator skin assembly.

10.17.0 Remove Connector Shelf Assembly
Remove four Phillips head screws, securing connector shelf to defibrillator skin assembly.

10.18.0 Installing Safety Shield

When bottom cover is removed from the defibrillator, a safety shield must be installed over the active components of the defibrillator.

Secure safety shield as shown below in Figure 10.17.

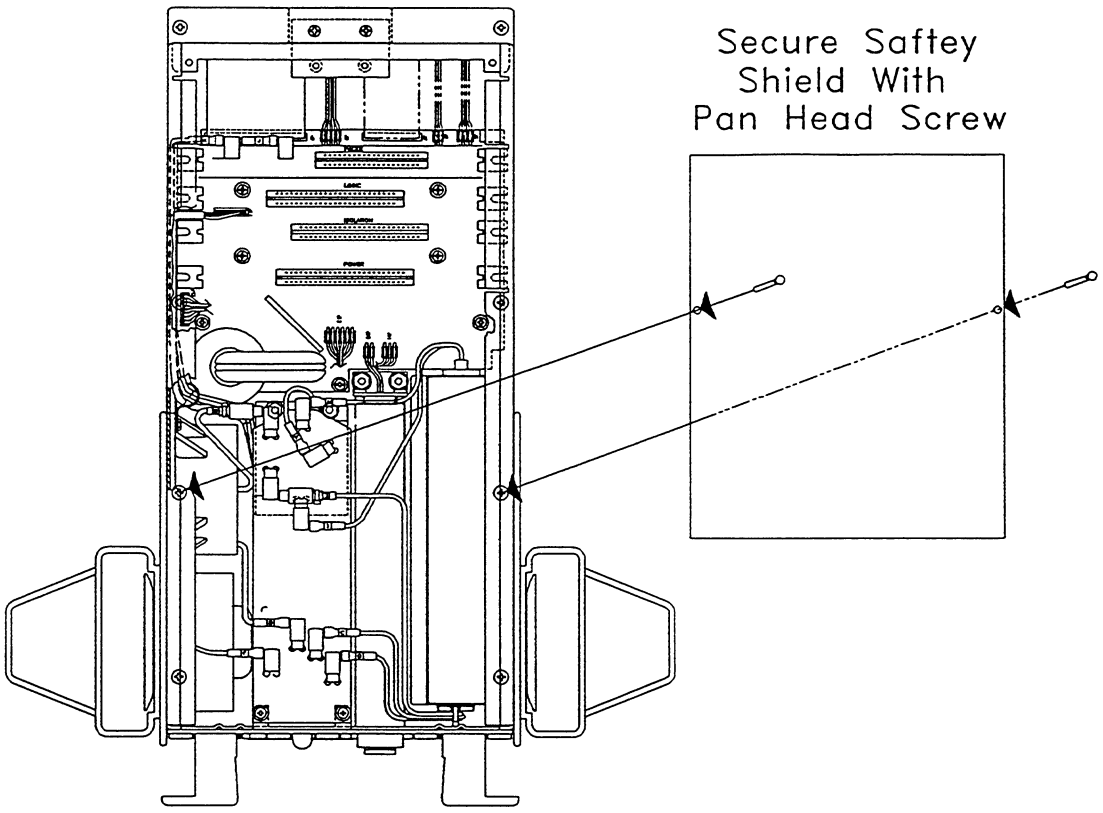


FIGURE 10.17

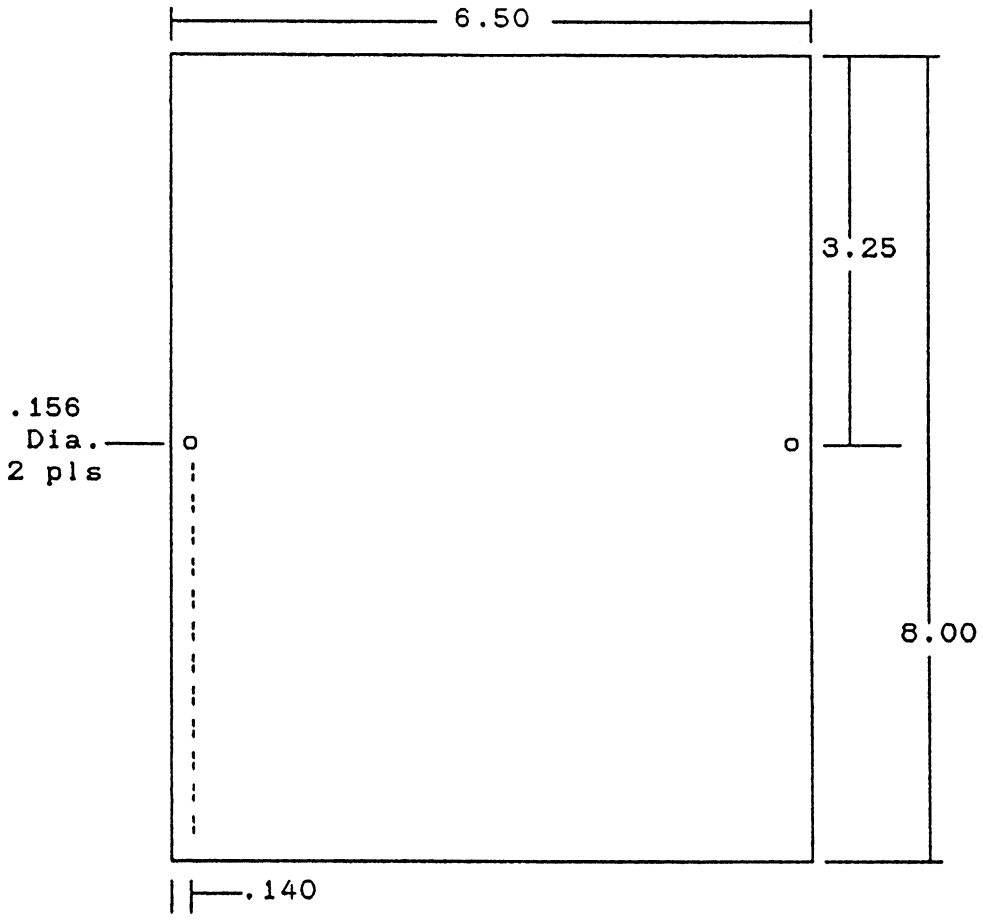
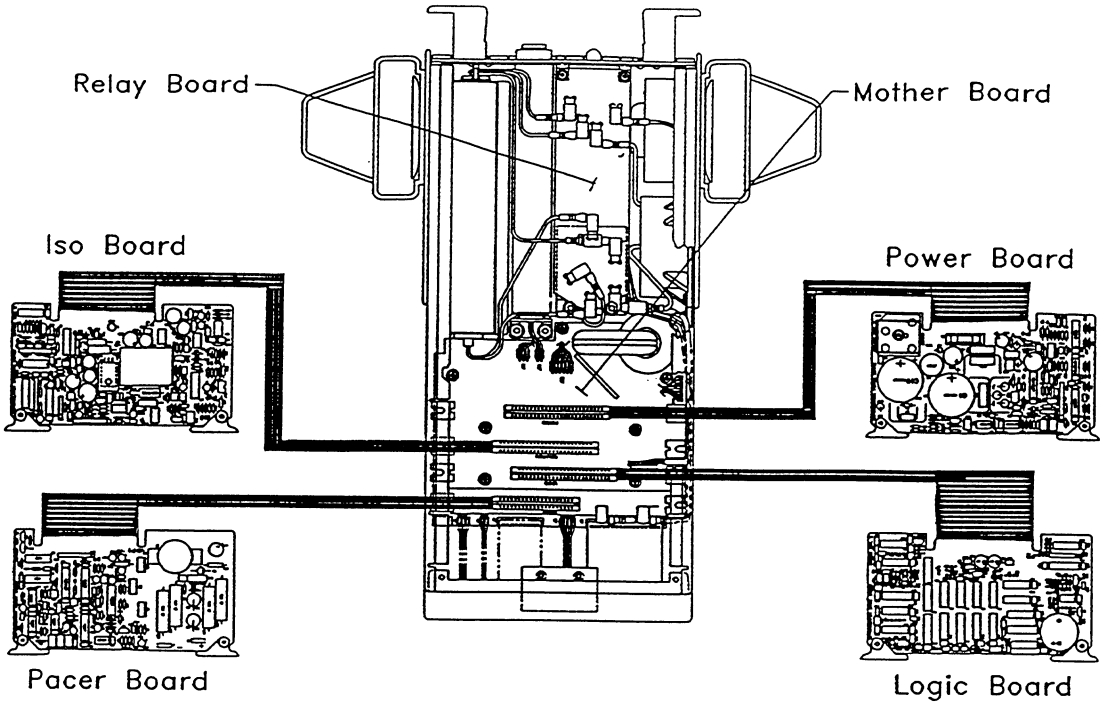


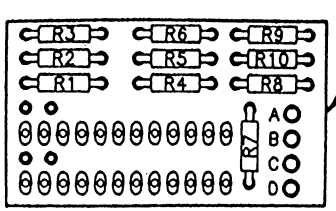
FIGURE 10.18

NOTE: This shield should be secured to bottom of defibrillator unit, over the High Voltage section, whenever existing cover is removed for servicing.



BOARD LAYOUT

FIGURE 10.19



1 SHOWN WITHOUT SWITCH & WIRES

SEE DETAIL 3 SW2

SILICONE, SILITE 385000-0002 (AS REQ)

BRN 6

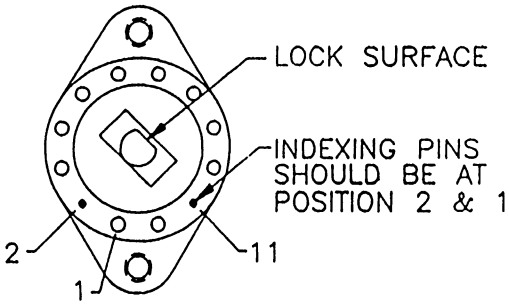
BRN 5

RED 4

MARK CONNECTOR 2 P6

1
2

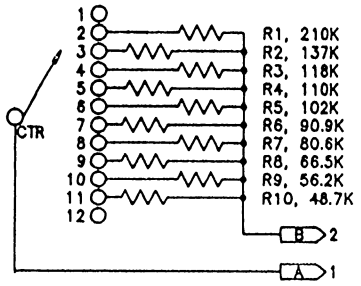
3.60" LG

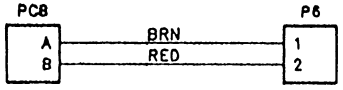


SWITCH DETAIL
SCALE: NONE

KNOB AND COVER ASSY REMOVED FOR CLARITY

SCHEMATIC





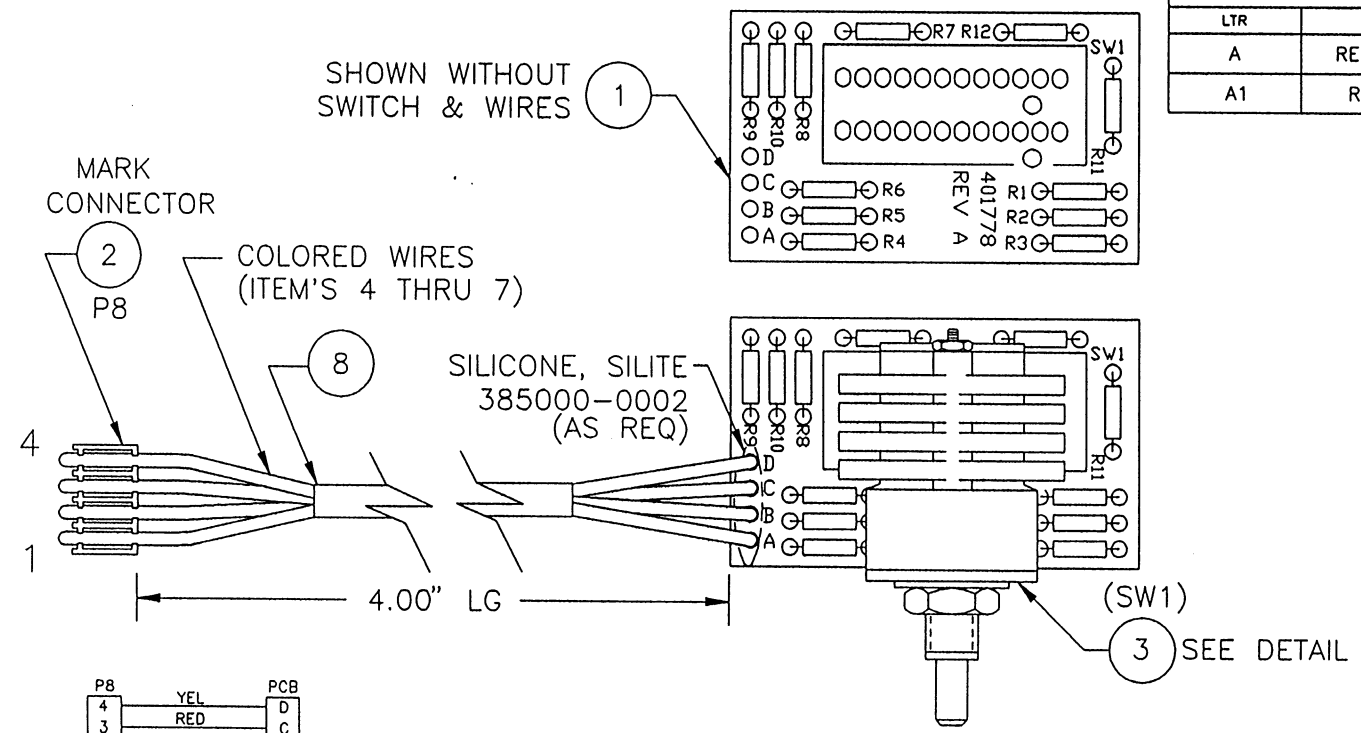
SCHEMATIC

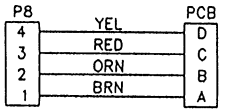
NOTES:
1. ALL RESISTORS ARE 1/8W, 1%.
2. SWITCH TYPE-BREAK BEFORE MAKE (12 POS).

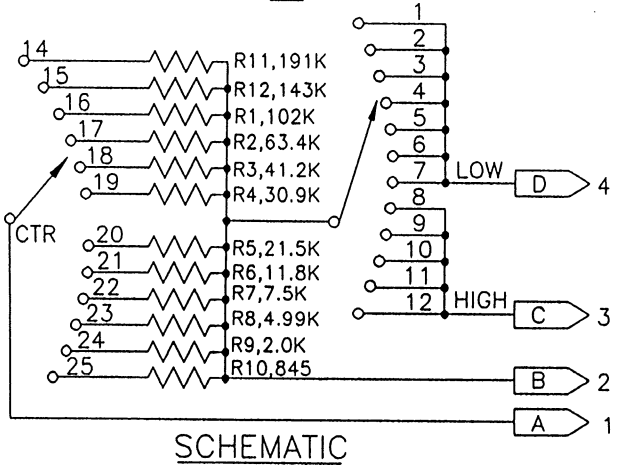
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	RELEASED ECO 965	7-15-91	
A1	REVISED PER DCO 100	10-28-91	
A2	REVISED PER DCO 142	10-28-91	
A3	REVISED PER DCO 155	12-26-91	
A4	REVISED PER DCO 190	12-26-91	
B	REVISED PER ECO 1088	2-4-92	
C	REVISED PER ECO 1117	2-25-92	
D	REVISED PER ECO 1123	3-16-92	

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ±1/16 ± .XX .25 ±	MDE MEDICAL DATA ELECTRONICS		
APPROVALS	DATE	PACER RATE SW PCBA DEFIBRILLATOR	
DRAWN AJM	1-21-91		
CHECKED		SCALE 2X / SIZE B / DRAWING NO 401450 / REV D	
4014501D.DWG	DO NOT SCALE DRAWING	SHEET 1 OF 1	

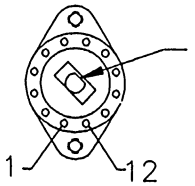
REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
A	RELEASED PER ECO 1131	4-21-92	
A1	REVISED PER DCO 309	5-15-92	







SCHEMATIC



SWITCH DETAIL

SCALE: NONE
SEE NOTE 3

NOTES:

1. ALL RESISTOR VALUES ARE IN OHMS, 1/8W, 1%.
2. SWITCH TYPE-BREAK BEFORE MAKE (12 POS).
3. KNOB AND COVER ASSY REMOVED FOR CLARITY.

TOLERANCES UNLESS OTHERWISE SPECIFIED FRACTIONS DEC ANGLES ±1/16 ± .XX .25 ±		MDE MEDICAL DATA ELECTRONICS		
APPROVALS	DATE	ENERGY SEL SW PCBA DEFIBRILLATOR		
DRAWN R.TERRANOVA	4-16-92			
CHECKED		SCALE 2X	SIZE B	DRAWING NO 401815 REV A1
4018151A.DWG		DO NOT SCALE DRAWING		SHEET 1 OF 1

Assembly	Description	Group	PFC	Commodity Class	Planner Buyer	Drawing	Rev	LT
401450-0000	PCBA, DEFIB PACER RATE SWITCH REV. D (E1123)			A			D	6

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401433-0000	*1	1	PCB, DEFIB ROTARY SWITCH REV C(E1171A)UL/CERTS REQ	C	R	22	1.000	EA	1	Yes		
354000-0244A	*1	2	CONN, 2-P,F,22GA,.1CTR,IN S.DISP MASS TERM		R	22	1.000	EA	2 P6	Yes		
380000-0026A	*1	3	SW, 1-GANG,ROTARY		R	22	1.000	EA	3 SW2	Yes		
399100-0012A	*1	4	WIRE, RED 22 GA PVC,HOOK-UP MUST BE 1000'MIN ROLL		R	11	0.370	FT.	4 (4.4"LG)DON'T ISSUE	Yes		
399100-0011A	*1	5	WIRE, BROWN 22GA, PVC,HOO K-UP 1000' MIN PER ROLL		R	11	0.370	FT.	5 (4.4"LG)DON'T ISSUE	Yes		
385000-0004A	*1	6	SHRINK TUBING, 1/8in BLAC K VW-1		R	11	3.500	IN.	6 DO NOT ISSUE	Yes		
370202-4872A	*1	7	RES, 48.7K,1/8W,1%,MF		R	22	1.000	EA	R10	Yes		
370200-5622A	*1	8	RES, 56.2K,1/4W,1%,MF		R	11	1.000	EA	R9	Yes		
370202-6652A	*1	9	RES, 66.5K,1/8W,1%,MF		R	22	1.000	EA	R8	Yes		
370202-8062A	*1	10	RES, 80.6K,1/8W,1%,MF		R	11	1.000	EA	R7	Yes		
370202-9092A	*1	11	RES, 90.9K,1/8W,1%,MF		R	22	1.000	EA	R6	Yes		
370200-1023A	*1	12	RES, 102K,1/4W,1%,MF		R	11	1.000	EA	R5	Yes		
370200-1103A	*1	13	RES, 110K,1/4W,1%,MF		R	11	1.000	EA	R4	Yes		
370200-1183A	*1	14	RES, 118K,1/4W,1%,MF		R	11	1.000	EA	R3	Yes		
370200-1373A	*1	15	RES, 137K,1/4W,1%,MF		R	11	1.000	EA	R2	Yes		
370200-2103A	*1	16	RES, 210K,1/4W,1%,MF		R	11	1.000	EA	R1	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
500194	DEFIBRILLATOR PACER OPTION ASSY. REV. A3 (D225)			F/A	F				A3	11

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401478-0000	*1	1	DEFIB PACER OPTION BEZEL ASSY. REV. B (E1161)	B	A	6	1.000	EA	1	Yes		
401461-0000	*1	2	DEFIB BEZEL ASSY REV. B (E1161)	B	A	6	-1.000	EA		Yes		
401438-0000	*1	3	PCBA, DEFIB PACER REV. C (E1117)	C	A	5	1.000	EA	2	Yes		
401559-0000	*1	4	DEFIB PACER SHIPPING KIT REV. A1 (D139)	A1	A	11	1.000	EA	3	Yes		
401562-0000	*1	5	PCBA, DEFIB PACER DUMMY R EV. B (E1064)	B	A	22	-1.000	EA	-	Yes		
401565-0000	*1	6	FISH PAPER,DEFIB PLUG-IN PCB's REV. B (E1112)	B	R	22	1.000	EA	4	Yes		
401608-0000	*1	7	LABEL, DEFIB/PACER INSTRU CTIONS, REV. A (D117)	A	R	22	1.000	EA	5	Yes		
401605-0000	*1	8	LABEL, DEFIB INSTRUCTIONS , REV A (D117)	A	R	22	-1.000	EA	1	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401815-0000	PCBA, ENERGY SELECT SW DEFIB-12-POS REV A (E1131)			A				A	6

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401778-0000	*1	1	PCB, DEFIB ENERGY SELECTOR SWITCH		R	22	1.000	EA	1	Yes		
354000-0251A	*1	2	CONN, 4-P,F,22GA,.1CTR,INS.DISP MASS TERM		R	22	1.000	EA	2 P8	Yes		
380000-0032A	*1	3	SW,2-GANG ROTARY 12 POS BRK B4 MAKE,15 IN/OZ TORQU		R	22	1.000	EA	3 SW1	Yes		
399100-0011A	*1	4	WIRE, BROWN 22GA, PVC,HOOK-UP 1000' MIN PER ROLL		R	11	0.400	FT.	4-(4.7"LG)DON'T ISSUE	Yes		
399100-0012A	*1	5	WIRE, RED 22 GA PVC,HOOK-UP MUST BE 1000'MIN ROLL		R	11	0.400	FT.	5-(4.7"LG)DON'T ISSUE	Yes		
399100-0013A	*1	6	WIRE, ORANGE 22GA., PVC,HOOK-UP 1000' MIN PER ROLL		R	11	0.400	FT.	6-(4.7"LG)DON'T ISSUE	Yes		
399100-0014A	*1	7	WIRE, YELLOW 22GA, PVC,HOOK-UP 1000' MIN PER ROLL		R	11	0.400	FT.	7-(4.7"LG)DON'T ISSUE	Yes		
385000-0004A	*1	8	SHRINK TUBING, 1/8in BLACK VW-1		R	11	3.500	IN.	8 DO NOT ISSUE	Yes		
370202-8450A	*1	9	RES, 845,1/8W,1%,MF		R	11	1.000	EA	R10	Yes		
370202-2001A	*1	10	RES, 2.0K,1/8W,1%,MF		R	11	1.000	EA	R9	Yes		
370202-4991A	*1	11	RES, 4.99K,1/8W,1%,MF		R	11	1.000	EA	R8	Yes		
370202-7501A	*1	12	RES, 7.5K,1/8W,1%,MF		R	11	1.000	EA	R7	Yes		
370202-1182A	*1	13	RES, 11.8K,1/8W,1%,MF		R	22	1.000	EA	R6	Yes		
370202-3092A	*1	14	RES, 30.9K,1/8W,1%,MF		R	22	1.000	EA	R4	Yes		
370202-4122A	*1	15	RES, 41.2K,1/8W,1%,MF		R	22	1.000	EA	R3	Yes		
370202-6342A	*1	16	RES, 63.4K,1/8W,1%,MF		R	22	1.000	EA	R2	Yes		
370202-1023A	*1	17	RES, 102K,1/8W,1%,MF		R	11	1.000	EA	R1	Yes		
370202-2152A	*1	18	RES, 21.5K,1/8W,1%,MF		R	22	1.000	EA	R5	Yes		
100000	*1	19	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	FOR ASSEMBLY	Yes		
100000	*1	20	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	APPLY 385000-0041	Yes		
100000	*1	21	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	TAPE TO UNDERSIDE OF	Yes		
100000	*1	22	NOTES & SPEC. INSTRUCTIONS		P	0	0.000	EA	SWITCH BODY.	Yes		
385000-0041A	*1	24	TAPE, KAPTON, INSULATING 3/8 IN		R	22	0.000	IN	AS REQ. - DON'T ISSUE	Yes		
385000-0002A	*1	25	SILITE SILICONE 3 OZ (COLOR: CLEAR)		R	11	0.000	EA	AS REQUIRED	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
401815-0000	PCBA, ENERGY SELECT SW DEFIB-12-POS REV A (E1131)			A				A	6

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
370202-1913A	*1	26	RES, 191K,1/8W,1%,MF		R	11	1.000	EA	R11	Yes		
370202-1433A	*1	27	RES, 143K,1/8W,1%,MF		R	22	1.000	EA	R12	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	LT
500192	DEFIBRILLATOR ASSY. REV. D1 (D274)			F/A	F			D1	11

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401463-0000	*1	1	DEFIB SKIN ASSY REV. C (E 1177)	C	A	6	1.000	EA	1	Yes		
401464-0000	*1	2	DEFIB CONNECTOR SHELF ASS Y. REV. A2 (D280)	A2	A	6	1.000	EA	2	Yes		
401465-0000	*1	3	DEFIB HANDLE ASSY. REV. A 1 (D266)	A1	A	6	1.000	EA	3	Yes		
401466-0000	*1	4	DEFIB BOTTOM COVER ASSY. REV. B1 (D265)	B1	A	6	1.000	EA	4	Yes		
401462-0000	*1	5	DEFIB REAR PANEL ASSY REV . A2 (D191)	A2	A	6	1.000	EA	5	Yes		
401461-0000	*1	6	DEFIB BEZEL ASSY REV. B (E1161)	B	A	6	1.000	EA	6	Yes		
401459-0000	*1	7	DEFIB BATTERY HOUSING ASS Y REV. A1 (E158)	A1	A	6	1.000	EA	7	Yes		
401247-0000	*1	8	E3 BATTERY PACK W/ LABEL ASSY REV. A		A	6	1.000	EA	8 - GIVE TO TEST	Yes		
401432-0000	*1	9	PCBA, DEFIB RELAY REV. C2 (D247)	C2	A	5	1.000	EA	9	Yes		
401457-0000	*1	10	DEFIB DISCHARGE PLATE/CUS HION ASSY. REV. A (E965)	A	A	6	2.000	EA	10	Yes		
401444-0000	*1	11	PCBA, DEFIB MOTHER REV. D (E1201)	D	A	5	1.000	EA	11	Yes		
401436-0000	*1	12	PCBA, DEFIB LOGIC REV. E (E1148)	E	A	5	1.000	EA	12	Yes		
401440-0000	*1	13	PCBA, DEFIB ISOLATION REV . D (E1102)	D	A	5	1.000	EA	13	Yes		
401442-0000	*1	14	PCBA, DEFIB POWER REV. F (E1128A)	F	A	5	1.000	EA	14	Yes		
401410-0000	*1	15	MTG BLOCK FLANGE DEFIB DI SCHARGE PLT REV.A (E965)	A	R	22	2.000	EA	15	Yes		
401380-0000	*1	16	MTG BLOCK DISCHARGE PLATE REV. A (E965)	A	R	22	2.000	EA	16	Yes		
401473-0000	*1	17	DEFIB DISCHARGE PLT/RLY B D CBL ASSY REV. A2(D147)	A2	A	6	1.000	EA	17	Yes		
401095-0000	*1	18	PADDLE HOLSTER REV. B (E1 173)	B	R	22	2.000	EA	18	Yes		
401347-0000	*1	19	LBL, SERIAL NUMBER E3/E4		R	22	1.000	EA	19 - DO NOT ISSUE	Yes		
401452-0000	*1	21	FAB PAINT SCR,8-32x7/16"L G 82 DEG,FLH GREY - DEFIB		A	22	4.000	EA	21	Yes		
401451-0000	*1	22	FAB, SCR,6-32x1/4"LG FLH 100DEG PAINTED GREY-DEFIB		A	22	2.000	EA	22	Yes		
401449-0000	*1	23	FAB, SCR,4-40x1/4"LG FLH 82DEG, GREY(FM 358100-68)		A	22	4.000	EA	23	Yes		
358100-0098A	*1	24	SCR, 1/4-20x1/2"LG,100DEG FLTHD,STL,ZN		R	22	4.000	EA	24	Yes		
358100-0084A	*1	25	SCR, 6-32 x 5/16 PH PNHD (ANY PLATE)		R	22	5.000	EA	25	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	L
500192	DEFIBRILLATOR ASSY. REV. D1 (D274)			F/A	F				D1	1

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
358100-0036A	*1	26	SCR, 4-40 X 1/4,PH PNHD,ZINC OR ANY		R	11	11.000	EA	26	Yes		
358200-0004A	*1	27	WSHR, #4 FLAT STL ZINC,(.125ID,9/32OD,.025THK)		R	11	11.000	EA	27	Yes		
358200-0009A	*1	28	WSHR, #4 SPLIT LOCK		R	11	11.000	EA	28	Yes		
358200-0006A	*1	30	WSHR, #6 FLT STL ZINC		R	11	7.000	EA	30	Yes		
358200-0010A	*1	31	WSHR, #6 SPLT LCK		R	11	7.000	EA	31	Yes		
358200-0031A	*1	32	WSHR, #4 EXT TOOTH 100DEG COUNTERSINK LOCK STLCAD		R	22	4.000	EA	50	Yes		
360500-0038A	*1	33	NUT, #6-32,ELASTIC STOP,THIN PTTRN		R	11	8.000	EA	33	Yes		
360500-0024A	*1	34	NUT, #8 HEX,LRG PTRN		R	11	4.000	EA	34	Yes		
358200-0021A	*1	35	WSHR, #8 FLT STEEL,ANY PLATING		R	11	4.000	EA	35	Yes		
358200-0008A	*1	36	WSHR, #8 INT TOOTH		R	11	2.000	EA	36	Yes		
385000-0000A	*1	37	TY-WRAPS, 3IN LENGTH (1000/BAG)		R	11	4.000	EA	37	Yes		
401430-0000	*1	38	STUD DISK DISCHARGE PLATE REV. B (E1075)	B	R	22	2.000	EA	38	Yes		
401480-0000	*1	39	SHIPPING KIT FOR DEFIBRILLATOR REV. A4 (D219)	A4	A	6	1.000	EA	20	Yes		
401622-0000	*1	40	DEFIB DISCHARGE PLATE/RELAY BD ASSY. REV A (D147)	A	A	6	1.000	EA	49	Yes		
401562-0000	*1	41	PCBA, DEFIB PACER DUMMY REV. B (E1064)	B	A	22	1.000	EA	39	Yes		
401565-0000	*1	42	FISH PAPER,DEFIB PLUG-IN PCB's REV. B (E1112)	B	R	22	2.000	EA	40	Yes		
358100-0068A	*1	43	SCR, 4-40 x 1/4 FLTHD,PHP,SS,82 DEG		R	22	8.000	EA	41	Yes		
358100-0062A	*1	44	SCR, 6-32 x 1/4, PHL.FLTHD. 100 DEG. S.S.		R	11	2.000	EA	42	Yes		
358100-0041A	*1	45	SCR, 6-32 X 1/4 PHL PNHD		R	11	2.000	EA	43	Yes		
360500-0092A	*1	46	SPCR, 7/32"IDx3/8"ODx3/16"LG,AL,GOLD IRIDITE,RND		R	22	2.000	EA	44	Yes		
358100-0011A	*1	47	SCR, 6-32 X 3/8,PH PNHD,ZINC		R	11	4.000	EA	45	Yes		
354000-0254A	*1	48	CONN, SEALING CAP FOR 14-POS AMP RECEPT.		R	22	1.000	EA	46	Yes		
401471-0000	*1	49	DEFIB PACER CABLE ASSY. REV. A2 (D169)	A2	A	6	1.000	EA	47	Yes		
401605-0000	*1	50	LABEL, DEFIB INSTRUCTIONS A, REV A (D117)	A	R	22	1.000	EA	48	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
500192	DEFIBRILLATOR ASSY. REV. D1 (D274)			F/A	F				D1	11

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
366000-0025A	*1	51	EXTERNAL ADULT PADDLES, DEFIB (1 PAIR)*CRITICAL*		R	44	1.000	PR		Yes		
385000-0017A	*1	52	CABLE TIE MOUNT, ADHESIVE BACKED		R	11	2.000	EA	51	Yes		
385000-0027A	*1	53	CABLE CLAMP, 3/8 DIA BUNDLE #8 MFG.		R	22	1.000	EA	52	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	LT
401455-0000	DEFIB POWER TRANSFORMER ASSY. REV. A2 (D240)				A				A2	22

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
401448-0000	*1	1	XFMR, PWR,DEFIB REV. B (E 1193) **CRITICAL**	B2	R	33	1.000	EA	1	Yes		
354000-0236A	*1	2	PIN, CONTACT,CRIMP-TYPE,1 4-20AWG		R	22	5.000	EA	2	Yes		
354000-0156A	*1	3	CONN, HSNG,3-PIN		R	11	1.000	EA	3 P11	Yes		
385000-0004A	*1	4	SHRINK TUBING, 1/8in BLAC K VW-1		R	11	0.500	IN.	15 (1 PC @ .5")	Yes		
360600-0047A	*1	5	LUG, #6, INT. TOOTH, 7/8 IN LONG		R	22	1.000	EA	5	Yes		
385000-0005A	*1	6	SHRINK TUBING, 1/4in BLAC K VW-1		R	11	12.500	IN.	6(1PC@ 9",2",3PC@ .5"	Yes		
401092-0000	*1	7	AC MTG PLATE E3 DEFIB REV A . A (E965)		R	22	1.000	EA	7	Yes		
354000-0228A	*1	8	CONN, PWR,IEC,SOLDER TERM INAL		R	22	1.000	EA	8	Yes		
354000-0234A	*1	9	CONN, HSNG,5-POS PLUG,PWR		R	22	1.000	EA	9 P17	Yes		
399100-0038A	*1	10	WIRE, GRN/YEL 20GA 600V S TRAND PVC HOOK-UP UL1015		R	22	0.400	FT	10 (1 PC @ 4.75" LG)	Yes		
399100-0054A	*1	11	WIRE, YELLOW 20GA 600V ST RANDED PVC HOOK-UP UL1015		R	22	0.400	FT	11 (4.75" LG)	Yes		
399100-0050A	*1	12	WIRE, BLACK 20GA 600V STR ANDED PVC HOOK-UP UL 1015		R	22	0.400	FT	12 (4.75" LG)	Yes		
358100-0068A	*1	13	SCR, 4-40 x 1/4 FLTHD,PHP ,SS,82 DEG		R	22	2.000	EA	13	Yes		
354000-0157A	*1	14	CONN, CRIMP PINS, F		R	11	3.000	EA	14	Yes		

Assembly	Description	Group	PFC	Commodity Class	Planner	Buyer	Drawing	Rev	L
401454-0000	DEFIB COIL ASSY. REV. D (E1177)			A				D	

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
382200-0036A	*1	1	INDCTR, 30MH HIGH VOLT,W/ MOUNTING**CRITICAL**		R	22	1.000	EA	1	Yes		
354000-0256A	*1	2	CONN,R/A,QCK DISCON,22-18 AWG,FULL INSUL.205x.02TAB		R	22	2.000	EA	2 - B & D	Yes		
384000-0135A	*1	3	WIRE IDENTIFICATION MARKE R D,E,F (1 PKG)		R	22	0.000	PKG	10 (USE D)	Yes		
384000-0134A	*1	4	WIRE IDENTIFICATION MARKE R A,B,C (1 PKG)		R	22	0.000	PKG	4 (USE B)	Yes		
385000-0008A	*1	6	SHRINK TUBING, 1/4in CLEA R VW-1		R	11	2.000	IN.	7(1PC 1.4",1PC .6")	Yes		
382000-0045A	*1	7	CYLINDRICAL MAGNETIC CORE		R	22	1.000	EA	6	Yes		
385000-0000A	*1	8	TY-WRAPS, 3IN LENGTH (1000/BAG)		R	11	1.000	EA	9	Yes		
385000-0024A	*1	9	SHRINK TUBING 1/2 IN DIA BLACK VW-1		R	22	1.000	IN	8 (1 PC @ 1")	Yes		

Assembly	Description	Group	PFC	Commodity	Class	Planner	Buyer	Drawing	Rev	L
401453-0000	DEFIB CAPACITOR ASSY. REV. B1 (D213)				A				B1	2

Shrinkage Factor: 0.000

ITEM	LEVEL	SEQ.	DESCRIPTION	REV	CL	LT	QUANTITY	U/M	REFERENCE	MLT	BEGIN	END
352600-0030A	*1	1	CAP,42mF,HI VOLT,4.8kV ** HANDLE W/CARE***CRITICAL*		R	44	1.000	EA	1	Yes		
370203-0126A	*1	2	RES, 12M,2W,5 OR 10%,10kV ,M.O.		R	44	1.000	EA	2	Yes		
399000-0018A	*1	3	WIRE, HIGH VOLT,20AWG,15k V,WHT,150 DEG C,UL(SILIC)		R	22	1.000	FT	3 (cut to 7" & 5.0")	Yes		
354000-0256A	*1	4	CONN,R/A,QCK DISCON,22-18 AWG,FULL INSUL.205x.02TAB		R	22	2.000	EA	4	Yes		
384000-0136A	*1	5	WIRE IDENTIFICATION MARKE R G,H,I (1 PKG)		R	22	0.000	PKG	5 (USE H(5") & I(7.0"	Yes		
385000-0008A	*1	6	SHRINK TUBING, 1/4in CLEA R VW-1		R	11	2.000	IN.	6 (CUT 2 PCS 1" LG)	Yes		
354000-0257A	*1	7	CONN, R/A,QCK DISCON,22-1 8AWG,FULL INS.25x.032 TAB		R	22	2.000	EA	7	Yes		
385000-0028A	*1	8	TUBING, SHRINK,3/16 IN BL K, UL VW-1,FIT221M		R	22	0.700	IN	8	Yes		
385000-0033A	*1	9	TUBING, SHRINK 3/16 RED,U L224/CSA198		R	22	0.700	IN	9	Yes		
352102-0222A	*1	10	CAP, .0022uF,6kV,20%,HIGH VOLT,CER DISC		R	22	1.000	EA	11	Yes		
385000-0018A	*1	11	SHRINK TUBING 1/8 IN CLEA R VW-1		R	11	1.000	IN.	10	Yes		

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